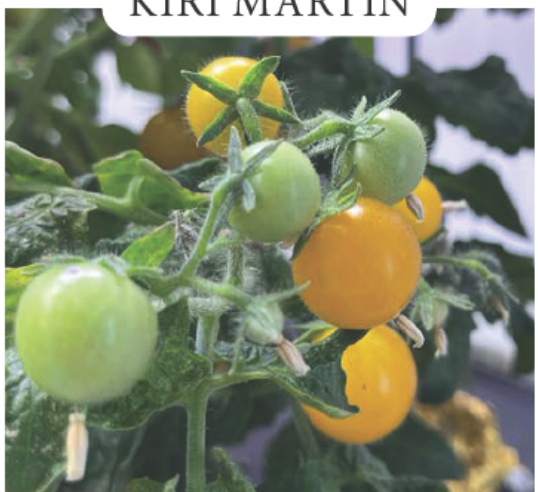
GUIDE TO Hydroponic Gardening

How to Grow Food in Any Space Without Soil or Sunlight

KIRI MARTIN



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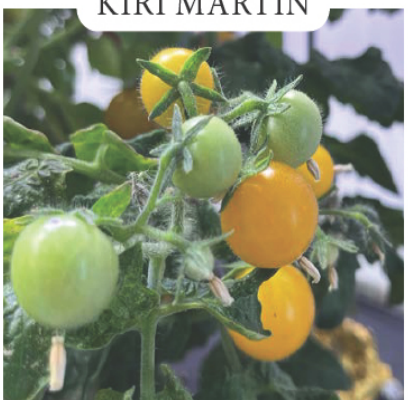

GUIDE TO Hydroponic *Gardening*

How to Grow Food in Any Space Without Soil or Sunlight

KIRI MARTIN

DEDICATION

For my mom, Janet, who taught me the love of growing food, even if she did grow silverbeet, which is gross.

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Macronutrients
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INTRODUCTION

Welcome to the start of your hydroponic journey—the fun, soil-free way to grow fresh food anywhere, anytime. Whether you live in a tiny apartment, deal with long, cold winters (like I do in Canada), or simply want a more efficient way to grow, hydroponics gives you the freedom to harvest herbs, greens, and even compact fruits and vegetables all year round.

This book is designed to be your beginner-friendly roadmap, guiding you step-by-step from seed to harvest. We'll start by exploring what hydroponics actually is and why growing without soil is not only possible, but practical, sustainable, and deeply rewarding.

I will walk you through the main types of hydroponic systems so you can see how they work, from water flow to nutrients to light. We will also dive into the common parts and accessories that make up a system, helping you understand what's essential, what's optional, and how to choose between ready-made kits and DIY setups. (We'll even look at the simplest, most budget-friendly option—the Kratky jar.)

From there, we'll move on to setting up your own system and deciding what to grow. While most systems come with preseeded pods to get you started, you'll learn how to expand beyond those options and grow the plants you truly love. In the later chapters, we'll walk through seed starting, plant care, and water testing, an often overlooked step that can make all the difference between struggling plants and a thriving indoor garden. You'll also learn about harvesting, succession planting (so you're never without fresh food), and how to transplant plants into soil or Kratky jars if you want to branch out further. To finish, we'll cover the most common mistakes beginners face and how to prevent—or recover from—them.

By the end of this book, you'll have the knowledge, tools, and confidence to turn any space into a productive green oasis. Hydroponics

isn’t just about growing food—it’s about growing freedom, creativity, and a closer connection to what you eat.

The CliffsNotes/Coles Notes Version of This Book

New can easily be overwhelming. If you have picked up this book because you want to start your indoor growing adventure or you have an AeroGarden® or other system gathering dust after a previous failed attempt, then let me give you my top tips. Once you’ve read the rest of the book, check back here often. If you remember nothing else, this quickreference list (I LOVE lists) will help you start on the right foot and set you up for a successful growing adventure!

1. **Have a plan and grow what you eat.** Decide which herbs or plants you use most frequently and use them as your starting point. Growing a bunch of herbs or other plants you don’t regularly use can be overwhelming to start with and frustrating if you’re not sure how to use what you’re growing.
2. **Know your goals.** Are you growing to have more control over your food? Are you growing to cut down on your grocery bill? Knowing your why will help you plan and help carry you through tougher issues like losing plants or dealing with pests or diseases.
3. **Put on the domes and make sure you take them off BEFORE the leaves are touching them.** The domes help increase humidity and help the seeds germinate. If they’re left on too long, they can trap condensation (water droplets) between the leaves and the dome, causing burning on delicate new leaves.
4. **Keep the light 4"–6"** (10.2–15.2cm) **above the tops of your plants.** If they are higher, your plants will stretch and become leggy (and weak) trying to reach the light. If they are lower, the top plants may touch the light and end up burned.

5. **Don’t plant in all the holes, end of story.** Things will get too crowded, and crowding is an open invitation for pests and diseases (and will be overwhelming for you)!
6. **Keep things covered to avoid any excess light reaching the nutrient solution!** That means covering any open holes with something opaque and covering the tops of your grow sponges (you can use stickers, foil, 3D-printed covers, or the covers provided with the grow sponges). Excess light can lead to algae blooms.
7. **If you test your water for only one thing, make that one thing the pH level.** Aim to keep it between 5.5–6.5 if you want to keep things simple. Even better, also test for electrical conductivity (EC) and aim for a range of 1–2.8. If you do test for both, always get your EC in range before adjusting your pH.
8. **Use an oscillating fan to create a gentle breeze for your plants.** This helps build strong stems, increase air circulation, reduce pests and diseases, and increase pollination (in selfpollinating varieties). It can also help prevent tip burn in lettuce.
9. **Pay attention and look at your plants regularly, learn how they grow, and track your data.** Issues, whether pests or other trouble, usually start long before big problems make them noticeable. You can learn a lot and avoid a lot of issues if you keep a close eye on things.
10. **Keep things clean (and this comes from someone who HATES cleaning her systems)!** The cleaner things are, the less risk of pests and diseases you’ll have. Most pest and disease issues can be kept at bay by keeping your system clean, disinfecting tools, having adequate air circulation, controlling the temperature and humidity, pruning, and maintaining your target EC and pH levels.
11. **You can grow most things hydroponically, but that doesn’t mean you should!** Just because you can grow broccoli, is it really worth the

space it will take up or the time to harvest? And do you even like broccoli?

12. **Don’t believe everything you see, read, or hear from other people—always test things out for yourself!** Just because I mention something in this book, or you’ve heard a piece of advice from your mother-in-law or bestie or online hydroponic guru, don’t take anything at face value! There are very few *right* or *wrong* ways to do things. It is always best to test things out and see how they work for you and your plants.
13. **Try something new.** While it is important to grow things you know you will eat, it is also important to try something different every now and then. Who knows, it may become your new favorite!
14. **Don’t give up!** The most important thing is to try. Some of your plants WILL die, but you will learn valuable lessons. If you run into an issue, look back at your process—is there anything you could have done differently? Look for the lesson in everything and, most importantly, TRY AGAIN! You don’t truly fail unless you give up. Anything you can grow at home is going to taste better and be more nutritious than what you’d buy at the grocery store.
15. **Have fun!** You don’t want to get to a point where you’re stressing over pH level or pruning or whatever and find that there is no joy left in this for you! Remember that plants can grow in the cracks of the sidewalk. Plants want to grow, and nature usually finds a way. Even if things aren’t perfect, as long as you are producing food and enjoying yourself, that is way better than having a bigger harvest but hating every minute of the process!
16. **Micro tomatoes are the small but mighty tomatoes that you need in your life!** Especially if you have a smaller system, these hard workers come in a variety of colors and can keep you in tomatoes all year round!

17. **Nutrients are essential for your plants to grow strong and healthy.** Make sure to get a good-quality nutrient mix that is suited for the plants you are growing and make sure it is made for a hydroponic setup. Keep it simple at the start and use one type for all stages of growth. If you run into issues or if you want to kick things up a notch later on, you can switch to nutrient mixes that are geared to the different stages of plant growth. As a newbie, though, whenever you’re in doubt, flush your system and start with a fresh mix of nutrient solution. Trying to fix individual problems without lab equipment is a recipe for disaster.

CHAPTER 1 - WHAT IS HYDROPONICS?

At its most basic, hydroponics is the act of growing plants in water using a soilless medium. The word hydroponics comes from the ancient Greek words *hydro* (water) and *pónos* (labor or work). Hydroponics relies on using water to carry all the nutrients necessary to support the growth of the plants. Basically, it leverages water to help grow plants without relying on soil. This both simplifies and complicates the whole process.

Water alone is not sufficient, of course. If we put a plant in water and stick it in a dark room, miracles will not happen. We still need other key elements, including nutrients, light, and a growing medium (although some would argue that this is optional, too). The main difference in this method of growing is that there is no soil involved. It is key to remember that soil is not the same as dirt: It is alive. It is full of goodies, such as microbes, nutrients, mycelium, bacteria, and all manner of creepy crawlies that help to make the soil so beneficial to plant growth. When we are growing hydroponically without soil, our plant babies rely on us to make up the difference.

A Brief History of Hydroponics

While you may think that hydroponics is some sort of newfangled creation, it has actually been around for an incredibly long time. The Hanging Gardens of Babylon, considered to be one of the Seven Wonders of the

Ancient World, was rumored to have piped water from the Euphrates River to flow through stone culverts filled with hanging plants. The Aztecs created *chinampas*, floating gardens (some up to 200 ft. [61m] long) made of rushes and reeds bound together with long roots and covered in nutrient-rich river mud. As the plants grew, their roots pushed through the rafts and into the lake below. There are Egyptian hieroglyphics depicting them growing plants in water. Ancient Chinese cultures created floating gardens to grow rice in areas devoid of soil.

Hydroponic systems, whether constructed or store-bought, make the bounty of the garden accessible in any space.

In somewhat more recent times, we have Jan Baptist van Helmont, who is credited with the earliest known scientific research into hydroponics (in the 16th century). In the 1600s, we have Francis Bacon, whose *Sylva Sylvarum: or A Natural History in Ten Centuries* is credited as being the earliest published work on hydroponics. It, in part, detailed his experiments

using spearmint to show that plants grew better in less pure water than they did in distilled water. We also have John Woodward, who is credited with creating the world's first hydroponic nutrient solution.

In the 19th century, Julius von Sachs and Wilhelm Knop conducted experiments to identify a list of nine elements believed to be critical for plant growth. In the 20th century, the term "hydroponics" was coined by William Frederick Gericke of the University of California, Berkeley. He was able to demonstrate the effectiveness of hydroponics by growing 25 ft. (7.6m) tall tomato plants in nutrient solution. Hydroponics even made an appearance in the Second World War, where it was used by British and US forces to grow food for soldiers on islands in the Pacific Ocean.

How Does Hydroponics Work?

When it comes to growing plants, there are some basic requirements: air, light, water, nutrients, root support, and space. As long as the hydroponic system provides for these basic needs, then you are good to go. The air is available in the room, and you can also leave an air gap in the tank or use an air stone. The grow light acts as a source of light and replaces the energy the plant would get from the sun. The water (much less of it) is recirculated within the closed system. The nutrients are provided in the water and directed right to the roots. The soil is replaced with a growing medium that provides root support. Your growing medium can be anything from perlite, coco coir, rock wool, leca (expanded clay) pellets, peat moss, or vermiculite. It seems simple, but the methods for achieving this balance vary.

Your first homegrown tomato is truly a source of pride. It doesn't matter if it is grown indoors or outdoors, it is a rite of passage.

The Good, the Bad, and the Ugly

There is no silver bullet when it comes to growing food, regardless of the method you use. There are benefits and drawbacks to every method, so let's dive into the good and bad of growing food hydroponically.

THE GOOD

The best part about hydroponics is that plants grow faster and yield more in hydroponic systems than they do in soil. This is primarily due to the ability to more closely control the optimal growing conditions. Mother Nature doesn't have a say indoors. You can also grow more in a smaller footprint since you can grow vertically using a tiered system. Hydroponics also uses way less water than is needed when growing in an outdoor garden. Why?

Well, the water is being delivered directly to the plant rather than travelling through the soil. The water is also being continuously recycled, so less is bound up in organic matter or lost to evaporation, runoff, and microorganisms. Weeds are another thing you don't have to deal with (which is a huge plus in my book). The time you would have spent weeding can be spent relaxing or learning even more about growing food! Growing food hydroponically also helps you remove pesticides from the equation and reduces the distance between where your food is grown and your plate. One final plus, especially for someone like me who lives in a cold climate, is that you have the potential to grow year-round.

PROS OF HYDROPONIC GARDENING

- Plants grow faster and have higher yields using less space
- You use less water and should have fewer pests
- Weeds and pesticides are not an issue
- You can grow food year-round
- Short distance between where the food is grown and your plate

THE BAD

Now that we know the good, we must also consider the bad of growing hydroponically. First, these systems can get expensive! While you can often construct them yourself for less, doing so increases the learning curve significantly, and many people may not want to go the DIY route. Growing indoors is different from growing outdoors. Things that you might not need to be as diligent about in an outdoor garden become non-negotiables indoors (such as pruning). While it is great that we can grow more in a small space with hydroponics, it also means there is a bigger burden on you to keep things under control. You don't just have to prune the leaves and branches; you will also have to consider pruning the roots (something you definitely don't need to worry about in an outdoor garden). Also, when

growing hydroponically (without soil), there is less support for the plants, which would normally anchor themselves in the soil with their roots. The plants only receive the nutrients you provide, and they will be more susceptible to waterborne diseases. Some people also feel that hydroponically grown tomatoes taste “watery” and “less rich” than those grown in soil.

THE UGLY

And now for the ugly, which is really a worst-case scenario. While pests are less likely indoors, when they happen, it can be devastating. Pests can come in on your clothes or pets, they can sneak in on a new houseplant or through an open door or window, or they sometimes even come in via the seed pods you buy for your system. Once they are inside, where there are none of the predators that would help keep them in check outdoors, an infestation can quickly develop.

CONS OF HYDROPONIC GARDENING

- Systems can be expensive to buy
- Plants are dependent on you for **all** their nutrients
- You have to clean your system to keep the plants healthy
- Learning curve—growing indoors is different from growing outdoors
- Pruning of leaves, branches, and roots is very important

What Can You Grow?

It is almost always true that just because you can do something, it doesn’t mean you should. The same is true when it comes to growing things hydroponically. Just about anything *can* be grown hydroponically (yes, even potatoes), but it may not be the best method for everything. Even if something can be grown hydroponically, the amount of work needed to

make it viable may exceed the benefits. It also depends on the hydroponic method you're using. This book focuses primarily on store-bought and Kratky systems, so we'll be following the dos and don'ts for those methods (which means potatoes are out).

Unless you want to grow nonedible flowers that will bring you immense joy, I strongly recommend that you grow what you eat. While it is fun to grow all sorts of new things, it can be challenging and frustrating at harvest time if you don't know how to use them! Take some time to track what you buy from the grocery store—it can be good to track what you eat month over month, even while you are growing! This will help you to refine your growing plan over time and help cut down on your grocery bill.

These are gochujang peppers from Rise Gardens. I'll use them to make my own Korean chili paste.

Things That Grow Well

- Leafy greens
- Dwarf or micro tomatoes
- Herbs
- Bush beans
- Lemongrass
- Green onions
- Peppers
- Eggplant
- Flowers
- Strawberries
- Radishes*
- Beets*

*However, I don't recommend these last two—more on that later.

If you are looking for a fast-growing crop and like a little spiciness in your salad, try some radishes. Planting 4–6 seeds per pod will give you more bang for your grow sponge.

Marigolds can help keep pests away indoors, just like they do outdoors. They also help to add a pop of color to your hydroponic system.

Bush beans grow great hydroponically; it's especially useful to increase the number of seeds you have on hand when a special variety is getting low.

I am always amazed just how big basil leaves grow in a hydroponic environment! It's perfect for making pesto.

Things That Don't Grow Well

- Potatoes
- Squash
- Melons
- Cucumbers
- Onions
- Most brassicas (broccoli, cauliflower, cabbage, and brussels sprouts)*
- Indeterminate tomatoes (see here)
- Corn
- Peas*
- Pole beans
- Carrots

*This excludes dwarf varieties.

Avoiding Overwhelm

When people ask me if hydroponics is worth the trouble, my answer is always a resounding YES! Being able to grow fresh fruits and veggies when there are a few feet of snow outside is a total win in my book—I can harvest food *and* be around the plants I love all year long. It is also easier to observe plants indoors than it is in the garden. This observation lets me learn more, and I can apply those same lessons in my outdoor garden as soon as nature allows.

Every person is going to be growing for different reasons. For some it might be that they live in a cold climate or want to cut down on their grocery bill. For others it may be a lack of outdoor growing space or simply a desire to prove they can keep a plant alive. Having a really strong why is important! Your reason is your own, and it is important to identify it. When times get tough and you want to give up, knowing your why will help keep you motivated. I have many whys. My main why is my ability to grow

healthy, nutritious food year-round (I’m also motivated by cutting down on my grocery bill).

My nephew was eating a dragon fruit and asked if he could put some of its seeds into my sister’s AeroGarden®. This little gem was the result!

I’ve even started a little lemon tree in my AeroGarden Farm Plus.

Growing food can be hard, whether you’re growing outdoors or hydroponically. Over the years, I’ve found myself overwhelmed by both many times. It is normal and holding on to your why will help to reduce this feeling and remind you why you are doing this incredible thing (growing your own food). One of the best tools for avoiding overwhelm is the obvious one of not taking on too much. This is easier said than done, especially if you just got a new system and have all these amazing things to grow! Starting a little slower will help you get accustomed to what is needed, and you can pay closer attention to your new plant babies and learn a lot along the way.

When starting out with hydroponic gardening, many people worry about running up their water and electricity bills. When it comes to the water bill, hydroponics actually uses significantly less water than plants grown in soil. In most hydroponic systems, the water is being recirculated and is only being used by the plant itself. In an outdoor environment, you can lose water to evaporation, runoff, absorption, and microorganisms. In terms of the electricity bill, the LEDs used in most hydroponic systems are incredibly energy efficient. If you are truly concerned, start slowly and use data as your guide. Look back at your energy and water use month by month *before* introducing your system and then monitor it *after* to see if there is a noticeable difference. You can use that data to determine whether hydroponic growing is the right option for you.

Finding a pest is usually the time when most people give up. For them, the idea of having bugs in the house outweighs the benefits of growing herbs on the counter. Their why isn't strong enough to stand up to the difficulties and battling pests indoors when you don't have beneficial predators to help can certainly be tough.

Offense is the best defense when dealing with pests, and if your why is strong and you approach every setback as an opportunity to learn, you'll avoid feeling overwhelmed. Always keep in mind that you aren't the first person to struggle with these problems, so there are solutions out there. Sometimes walking away for a bit can be the best medicine. You'll come back even stronger in your mission after a short respite from the problem.

Good, Better, Best

"Good, better, best" is my mantra for gardening. In gardening of all types, especially online, there are many people positioning themselves as the only authorities on the subject, presenting their opinions as the right or wrong way to do things. Nothing could be farther from the truth. We all live in different places, and have different climates, budgets, infrastructure, and goals—it's impossible for there to be only one right way. This applies equally well to outdoor and indoor gardening. This is why I use a good,

better, best approach and strive to allow more flexibility. I will share the techniques and methods I use and what works well for me, but I will also present all the options available so you can adjust your methods as needed for your own circumstances.

So, let's look at an application of this good, better, best approach. This approach should help new indoor growers avoid confusion, guilt, overwhelm, or "analysis paralysis," and keep them from giving up too soon. Here's what this perspective looks like when comparing different ways to get started:

Starting anything new can feel overwhelming. Having a strong and solid why that is important to you will help you overcome the overwhelm.

✔️ **GOOD:** Using a store-bought system out of the box using the preseeded pods and stock nutrients.

✔️ **BETTER:** Using a store-bought system out of the box and pairing the seedless/grow-anything pods with heirloom seeds and new nutrients.

✔️ **BEST:** Using a store-bought system but making sure any empty holes are covered and that you have a fan blowing a gentle breeze. Pairing seedless/grow-anything pods with seeds you saved yourself from open-pollinated plants you grew yourself in your hydroponic environment. To add a cherry on top of this “best” version, you’re also leveraging pest control measures, testing your water regularly, and succession planting so that you never have empty space and are always growing food.

You can make hydroponic gardening as simple or as complex as you want. The most important thing is that you enjoy the process of growing food indoors and get some delicious food for your efforts. Other than that, everything else is just noise.

CHAPTER 2 - UNDERSTANDING HYDROPONIC SYSTEMS

No matter what system you choose, it can be as simple or complex as you want and need it to be.

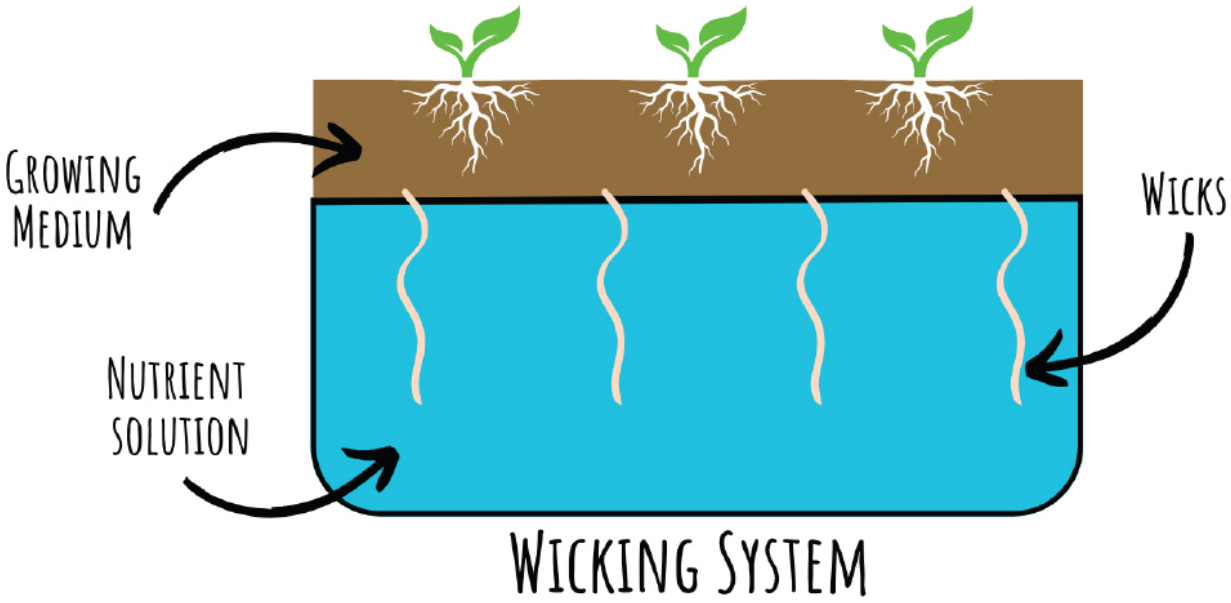
There are six main types of hydroponics: wicking, deep water culture, ebb and flow, drip, nutrient film technology, and aeroponic systems. They sometimes go by different names, and there are additional subtypes, but we need to understand the differences between these six main types before moving forward. This is especially important if you aspire to one day dip your toe into the world of DIY hydroponic builds.

Wicking Systems

Wicking systems are those systems in which the water and the nutrients are held in a tank sitting below the roots. The plants and their roots are supported by a soilless medium, such as lightweight expanded clay aggregate (leca), perlite, or coco coir, which is in direct contact with the wick. The other end of the wick sits in the water/nutrient solution below and delivers the nutrients and water directly to the root zone of the plants. In this kind of system, the nutrient solution is not aerated.

So, let’s look at some of the reasons why wicking systems are a great choice. These are passive systems that don’t need any electricity to function. They rely on capillary action to move the water upward against gravity. If you live somewhere where power outages are common, are living off-grid, or just don’t want something that uses power, then wicking systems should be at the top of your list! They are also one of the cheapest systems to build and the maintenance costs are minimal. Finally, if you are just not 100 percent comfortable with growing hydroponically yet, wicking systems can work with soil.

On the not-so-rosy side, these systems are better suited to plants that don’t mind a moister environment because the wick is constantly absorbing moisture from the nutrient solution. This also makes them less efficient than other types of hydroponic systems. The wick that is the heart of this type of system can also create some unique problems. Depending on the wick used, there can be uneven nutrient distribution, which can negatively affect plant growth. Should a wick ever fail, the plants would have no way to access water and nutrients, and they would die.



A wicking system is a simple, low-cost hydroponic system that is a great beginner DIY. It relies on a passive method in which the wicks draw the nutrient solution up to the plant roots.

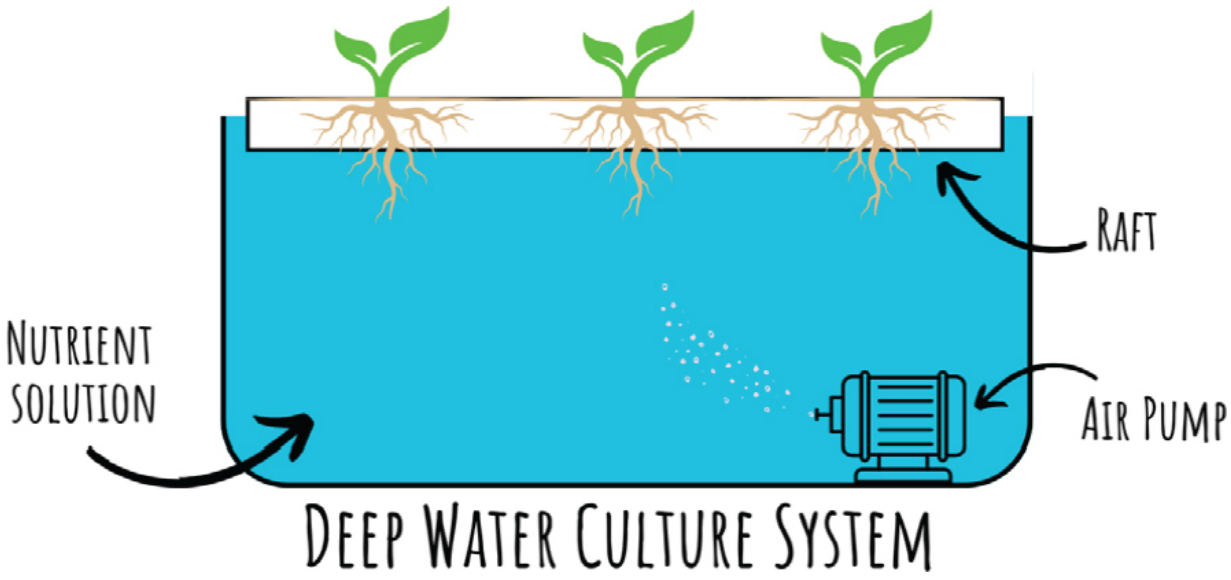
PROS

- No electricity needed, so no impact from power outages
- Cheap to build and maintain

CONS

- Wicks can be inefficient, and if they fail, plants will die
- Uneven nutrient distribution can occur
- Nutrient solution is not aerated

Deep Water Culture Systems



Deep water culture has the plant roots suspended directly in the nutrient solution. A pump is required to ensure that the roots have access to enough oxygen.

In a deep water culture system (also known as a DWC or reservoir system), the plant roots are submerged in the nutrient solution 24/7. This necessitates the presence of an oxygen source, typically an air stone (see here). Without it, the plants would just drown. The plants are suspended above, typically in a raft that sits on the water/nutrient solution. In this type of system, the roots are able to directly take up nutrients from the solution. It is one of the simplest, easiest, and cheapest hydroponic systems to set up!

Since they're so cheap and easy to set up, DWC systems are great for anyone new to hydroponics. A deep water culture system doesn't have a lot of moving parts, which helps to keep maintenance costs low. These systems can result in faster growth (than a wicking system, at least) since the plants have such easy access to both nutrients and oxygen via the solution they are suspended in. The roots can be in constant contact with the nutrient solution as long as the solution is kept at the right level.

On the flip side, the addition of an air pump and the associated oxygen can lead to increased algae growth—definitely a problem no one wants to deal with. DWC systems are noncirculating, meaning that any issues with temperature or pH can quickly become very big problems. The same is true if the pump breaks and no oxygen is entering the nutrient solution—your

plants will drown. Finally, even with a pump and an air stone, these types of systems can have issues with oxygenation that can lead to root rot, which is bad news for your plants.

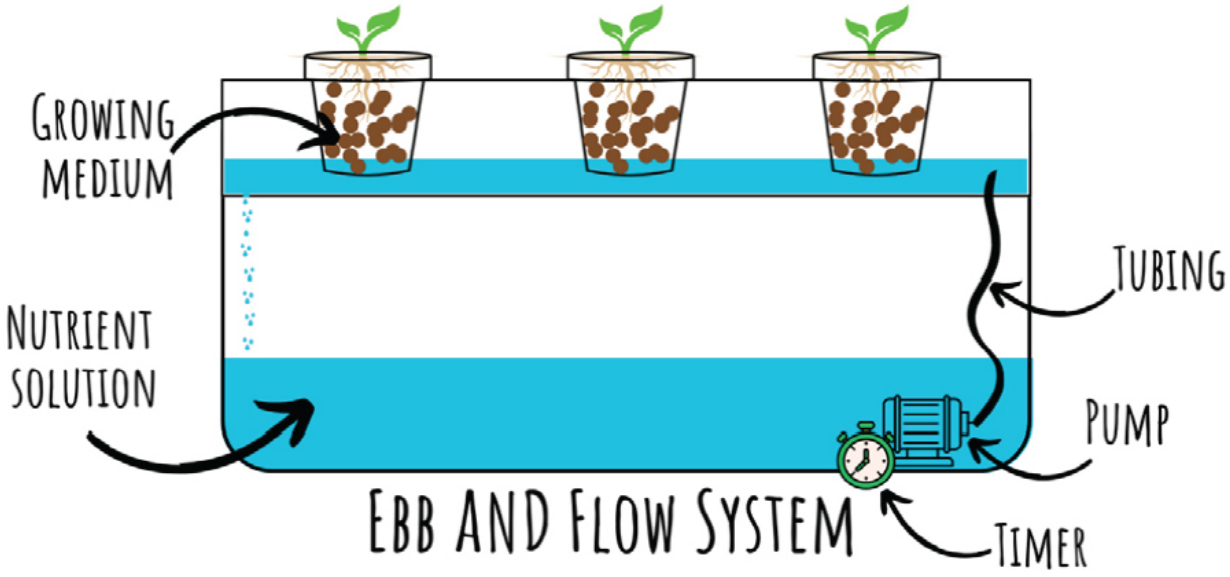
PROS

- Simple and cheap to set up and maintain
- Nutrient solution is aerated
- Roots have direct access to the nutrient solution

CONS

- Algae growth in the nutrient solution can be a problem
- Root issues can occur
- Plants can die if the pump breaks

Ebb and Flow Systems



An ebb and flow system uses a timer to create a cycle that floods the plant roots with the nutrient solution for a specified period of time. It then lets it drain away, exposing the roots to the air until the next flood cycle.

In an ebb and flow system (also known as a flood and drain system), the nutrient solution is periodically pumped up to flood into the upper area where the pots containing the growing medium are located (the flow cycle). Then, it slowly drains back out again and returns to the reservoir below (the ebb cycle) until the next flood cycle. The scheduling of the flooding is controlled by a timer. Typically, this type of system uses lightweight expanded clay aggregate (leca) pellets.

In an ebb and flow system, there is less chance of algae growth, and the plants are less likely to become waterlogged since they are not continuously submerged in water. This type of system also introduces a level of control over the watering schedule that is not present in wicking or DWC systems. Because the presence of the water is controlled by a timer, the duration of time in which the plants are in contact with water can be changed as the plants grow and their needs change. Lastly, plant roots can be healthier in this type of system since they are exposed to air during the ebb cycle.

These types of systems are more complex to set up and maintain, as they have a lot more moving parts. You need to account for the pump and timer and how they interact, as well as the drainage system. Power outages are

harmful to an ebb and flow system. Not only will an outage stop the pump from working, but it will also affect your timer. From a maintenance perspective, you will also need to make sure that the pump and drainage system do not become clogged, since that will affect the ebb and flow cycle.

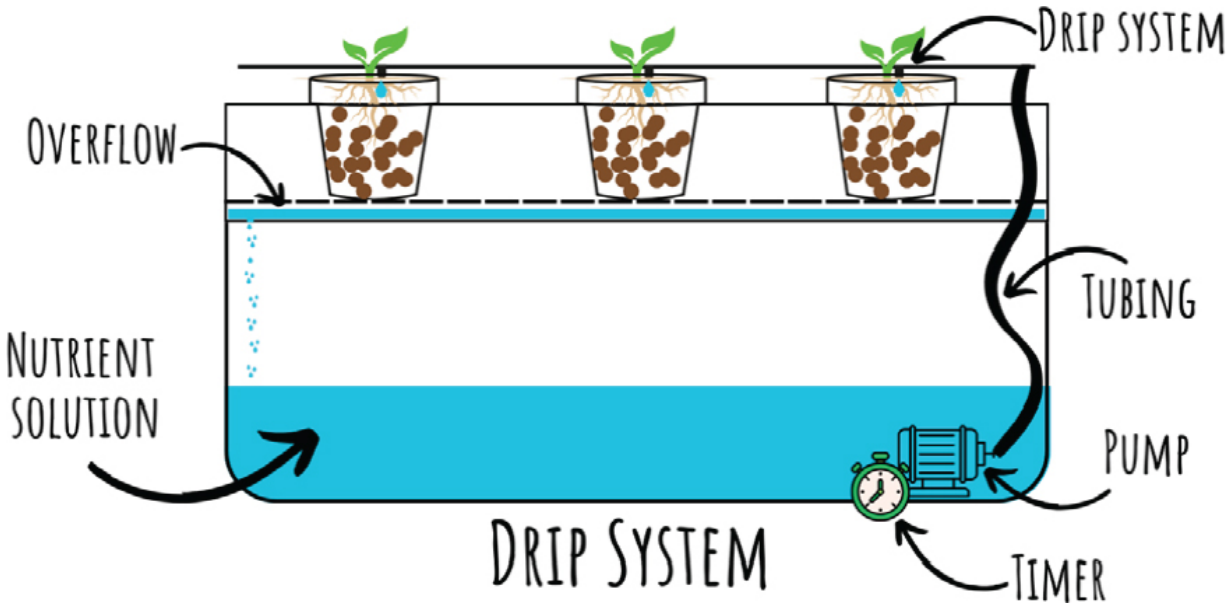
PROS

- Less chance for algae growth
- Water schedule can be controlled
- Increased root health

CONS

- More complex setup and cost
- Power outages affect pump and timer
- Increased maintenance needed

Drip Systems



Drip systems provide the nutrient solution directly to the base of the plant. This type of system is easily expandable to allow for more plants.

In a drip system, a flow regulator is used to slowly and precisely drip the nutrient solution onto the top of the growing medium near the base of the plant. Any excess liquid can drain into a reservoir below that recirculates the solution back up. These systems usually run 24 hours a day and have an on/off cycle that is regulated by a timer. This type of system is highly scalable, as multiple plants can be fed from the same reservoir by extending the tubing and adding additional drip nozzles. This is one of the most widely used types of hydroponic systems.

Drip systems are great because they allow for more precise control over both the water and nutrient delivery. The drip nozzles can direct the nutrient solution exactly where you want it to go. They are also very easy to scale up—you can start small with a single pot and add more as your confidence and experience grow. They also bring a level of versatility since you can incorporate pots of different sizes to work well with different types of plants with different space needs. They can also have a level of automation, similar to ebb and flow systems, since the delivery of the nutrients to the drip nozzles can be automated using timers.

On the other hand, drip systems can be more expensive and fiddly to set up. There is also added maintenance needed to make sure that both the tubing and drip nozzles don’t get clogged. A clogged nozzle or tube can mean plant death, since your plant would have no way to get nutrients. Power outages can affect drip systems since the pump would not work. However, if the plant roots have the ability to reach down into the nutrient solution, outages of short durations can be less impactful. These elements can make drip systems a bit daunting to newbie hydroponic growers.

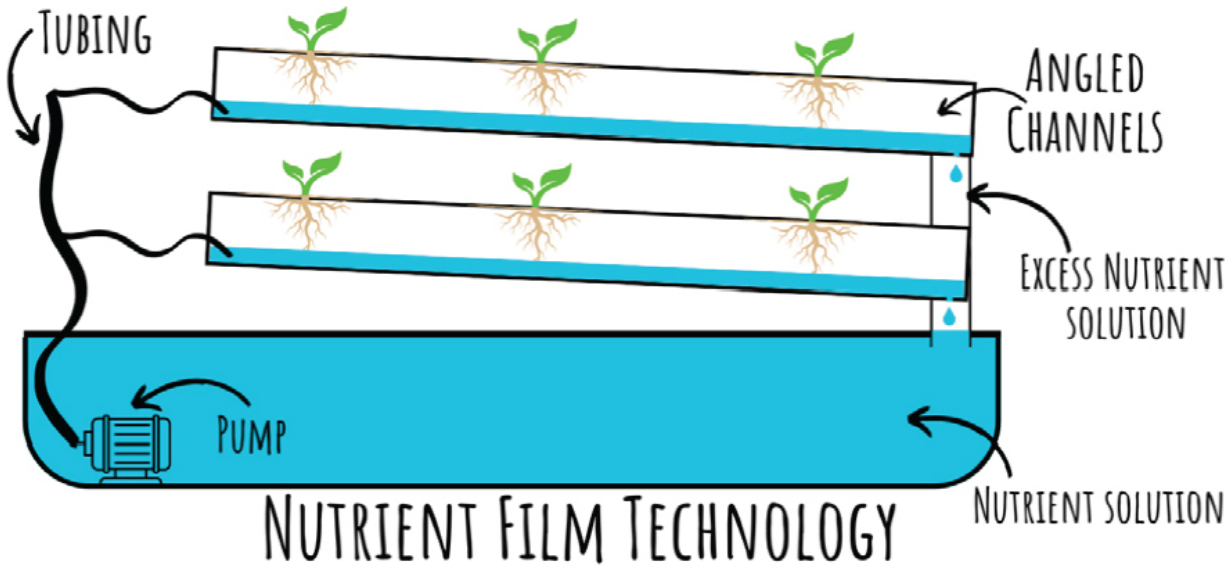
PROS

- Precise water and nutrient delivery
- Very scalable and versatile
- Can be automated using timers

CONS

- More expensive to set up and need increased maintenance
- Can be affected by power outages
- Can be overwhelming for newbies

Nutrient Film Technology Systems



In a nutrient film technology system, the nutrient solution continuously flows past the plant roots. The plant roots are not completely covered in the solution, so they have constant access to oxygen, as well.

A nutrient film technology (NFT) system relies on continuously delivering the nutrient solution to each plant's roots via channels. This is one of the most-used methods for growing leafy greens in commercial setups. The main benefit of this type of system is that you can grow many plants while only using a small reservoir. Additionally, this is a highly customizable type of system that can easily be set up inside, mounted on a wall! The channels have a thin film of nutrient solution flowing through, allowing the plant roots to continuously be exposed to air. Just remember that the channels (and plants) must be on a slight tilt to ensure the proper flow of liquid.

Because of their design, NFT systems are highly efficient at using both water and nutrients. If the solution is constantly flowing and accessible to the plants, then you don't need as much of it! They also tend to be easy to maintain and are more space efficient that other systems since they can be set up horizontally or vertically. They are also scalable, so you can start small and add more levels as needed.

But as with anything, it is rarely all just good news. These systems need pumps to move the nutrient solution into the start of the system, so they are definitely affected by power outages. Unlike in drip systems, the roots do

not have access to the nutrient solution if the pump fails regardless of how long the roots are. They will quickly dry out if power is lost. NFT systems are also not the best option if you want to grow tall plants, as it can be hard to provide the structural support they need.

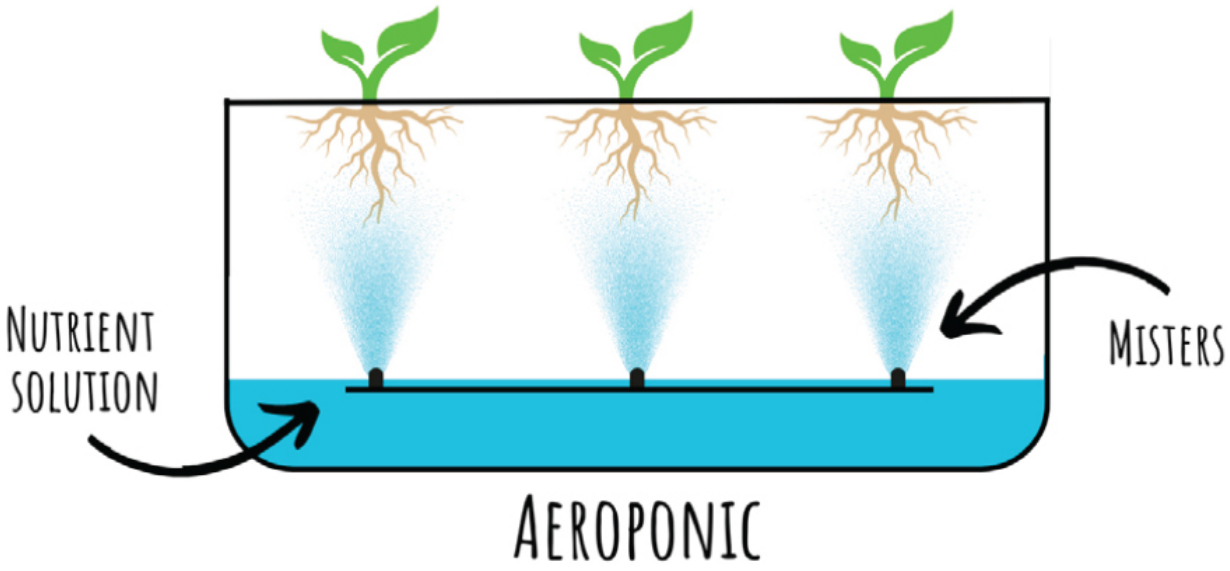
PROS

- Very efficient use of water and nutrients
- Space efficient and can be set up horizontally or vertically
- Highly scalable

CONS

- Impacted by power outages
- Not ideal for tall plants
- Roots will dry out if nutrient flow stops

Aeroponic Systems



Aeroponic systems have the plant roots dangling in midair. Spray emitters are used to expose the roots to the nutrient solution. This method provides plant roots with the maximum amount of oxygen exposure.

Aeroponic systems are the most complex hydroponic systems, but they also provide some great benefits. In an aeroponic system, the nutrient solution is sprayed/misted onto the roots, which hang suspended in the air. This system is so flexible that nearly anything can be grown using aeroponics. Plant growth is very fast in this type of setup, and water use is minimal. There is very little chance of root rot since the roots are not left submerged in the nutrient solution. The roots also have the most access to oxygen of any of the systems we have discussed. You can even grow things like garlic and potatoes using one of these systems!

All those benefits come with a flip side. The spray nozzles need careful maintenance to ensure they do not become broken or clogged. Without them, your plants will have no access to water or nutrients. They are also affected by power outages, and they are not well suited to tall or heavy plants that might be prone to falling over.

PROS

- Very fast growth with minimal water usage

- Roots are less prone to root rot
- Most oxygen to the roots of any of the hydroponic systems

CONS

- Probably the most complex of all the systems
- Impacted by power outages
- Not great for tall or heavy plants

Store-Bought Hydroponic Systems

A lot of the store-bought systems combine features from the different types of hydroponic systems covered above. The following section provides details about the systems from three companies that I have used over the years, including general cost estimates ranging from lowest ($) to highest ($$$$). These brands are by no means the only store-bought options available, but they are the only ones that I have personal experience with. Remember to research your options and build or buy the system that works best for your needs.

AEROGARDEN

AeroGarden is probably the most well-known of the store-bought brands because it has been around the longest. They currently offer four “families” of systems: Sprout, Harvest, Bounty, and Farm. Their systems are a hybrid of a drip system and a deep water culture system. The nutrients from the reservoir are pumped up and dripped on the top of the sponges (in all models but the Sprout), but the roots also have access to grow down into the nutrient solution.

According to their website, their seeds are not genetically modified (non-GMO), and they use no herbicides or pesticides. AeroGarden also offers a

“100% Germination Guarantee,” so if a pod doesn’t germinate, they will replace it for free.

AeroGarden offers many accessories, and they sell their sponges and baskets in bulk 50-piece packages. I also love their grow-anything pods, which are primarily the only ones I use (I only use preseeded pods if they come with a unit). One drawback, at least for me, is that they no longer ship to Canada.

SPROUT

The Sprout is the smallest of the AeroGarden lineup, but it works well if you only have a small space or just want to grow a few herbs on your counter. I love to use mine to conduct experiments. While it has three holes, I recommend planting only in the outer two to make sure that the plants have enough room to spread out as they grow bigger. If the plants are too close, it makes pest and disease issues more likely. I have grown herbs, micro tomatoes, mini peppers, and lettuce in mine. This model does not have any low water reminders, so you have to check it often, especially when the plants are larger.

Features

- Space to grow up to 3 plants

- 10" (25.4cm) grow height
- Pump to circulate water in the grow bowl
- 10W LEDs with a set 16 hours on/8 hours off schedule
- Food reminder light, but no low water reminder and no LCD display
- Includes a seed-starting system for outdoor plants
- No WiFi connectivity or app support
- Cost $

HARVEST

The AeroGarden Harvest is probably the unit most people buy when getting started with AeroGarden systems. It has spaces for growing up to six plants and comes in a variety of configurations and

colors/finishes. There is a basic version, a slim design, a circular design, an elite version, and an extra-large (XL) option.

Features

- Space to grow up to 6 plants
- 12" (30.5cm) grow height for all models (Harvest XL = 18" [45.7cm])
- Pump to circulate water in the grow bowl and drip system to water plants from above
- 20W LEDs on all models except the Harvest XL, which has 25W LEDs, and the Harvest 2.0, which has 15W LEDs
- Food reminder and low water light (upgraded models also have an LCD display and some models have vacation mode)
- Has a microgreen accessory and a seed-starting system for outdoor plants
- Features app support but no WiFi connectivity
- Cost $

BOUNTY

The AeroGarden Bounty is the fanciest of the countertop models. It allows for a maximum of nine plants, has a good-sized reservoir, and allows for up to 24" (61cm) of grow height! These models offer loads of features and are great if you have enough counter space, since they allow you to grow a larger variety of plants at once.

Features

- Space to grow up to 9 plants
- 24" (61cm) grow height for all models
- Pump to circulate water in the grow bowl and drip system to water plants from above
- Bounty Basic has 30W LEDs, Bounty has 40W LEDs, and Bounty Elite has 50W LEDs
- Food reminder, low water light, and vacation mode (upgraded models also have an LCD display)
- Has a microgreen accessory and a seed-starting system for outdoor plants
- All Bounty models (except the Bounty Basic) feature WiFi connectivity and app support
- Cost $$

FARM

The AeroGarden Farm is the biggest model that AeroGarden currently offers. They are available with twelve or twenty-four holes and in three different grow heights: 12" (30.5cm), 24" (61cm), or 36" (91.4cm).

Features

- Space to grow 12 to 24 plants
- 12" (30.5cm), 24" (61cm), or 36" (91.4cm) grow height
- Pump to circulate water in the grow bowl and drip system to water plants from above
- 60W LEDs on all models
- Food reminder, low water light, vacation mode, and LCD display
- Has a seed-starting system for outdoor plants
- All Farm models feature WiFi connectivity and app support
- Cost $$

RISE GARDENS

Of all the systems I have tried, Rise Gardens are some of my favorites and ones I recommend. Their big systems are based on nutrient film technology, and the Personal Rise Garden is a deep water culture system. My experience has proven them to be a highly innovative company that is

constantly learning and improving their products. In about five years, they have modified their grow pod packaging three times to make it easier to use.

Rise Gardens offers seedless pods, accessories, customizable grow deck configurations, and over 100 different preseeded pods, with new ones always being added.

PERSONAL RISE GARDEN

The Personal Rise Garden is the smallest and only countertop model of the Rise Gardens family. The switchable grow decks allow you to grow four, eight, or twelve plants in this little system. It allows for 12" (30.5cm) of grow height and has a pump to move and aerate the nutrient solution. This model is more of a deep water culture setup, much like the AeroGarden Sprout. I like this model for growing leafy greens and herbs, but it could grow micro tomatoes, as well.

Features

- Space to grow 8 plants, with modular grow decks to grow 4 or 12 plants instead
- 12" (30.5cm) grow height
- Pump to circulate water in the grow bowl

- Full-spectrum LEDs with dimming feature
- Care and low water light reminders and AI-based nutrient suggestions
- Comes with a nursery for starting your seedlings
- Features app support but no WiFi connectivity
- Cost $$

TIERED RISE GARDEN

In my experience, the tiered Rise Garden is the best way to grow big at home! You can buy the base tier, and it functions as a whole unit, but if you later want to add on one or two more tiers, you easily can. You can also start with the three-tier model, which offers the ability to grow the most food at home of any system I've yet tried.

Features

- Space to grow 36 to 108 plants, depending on the grow deck configuration
- Pump to circulate water through the entire system

- 18" (45.7cm) grow height on base tier and 10" (25.4cm) grow height on tiers two and three
- Full-spectrum LEDs with dimming feature
- Care and low water light reminders and AI-based nutrient suggestions
- Comes with one nursery per tier for starting your seedlings
- Features WiFi connectivity and app support
- Cost $$$$

CLICK & GROW

Click & Grow is the simplest of the three main store-bought brands. Their systems have no pumps, and they operate as a cross between a wicking system and a deep water culture system, depending on which of their pods you use. Their standard pods leverage the wicking method, and their pro pods create more of a hybrid system, as they allow the roots to access the water.

Notice I did not say nutrient solution—this is because the Click & Grow does not require any additional nutrients. Everything the plants need is included in the grow pods that go into the cups. These are great options for someone who doesn't want to mess around with nutrients or worry about pumps failing. Across the range of models, you can grow 3 to 51 plants.

Click & Grow offers a sprouting guarantee much like AeroGarden's: If a pod doesn't sprout, they will replace it. They also commit to planting a tree for every garden purchased—which is a nice added bonus.

SMART GARDEN 3

This smallest system of the Click & Grow family is around 4 ¾" (12.1cm) wide, so it is a bit larger than the AeroGarden Sprout. It is a great starter unit for keeping herbs on the kitchen counter and for those who don't want to mess about with a pump. As with the AeroGardens, I would not recommend planting in all the holes to make sure that the plants have enough room to spread out as they grow bigger. If the plants are too close, it makes pest and disease issues more likely. Planting too close together can also get overwhelming and will require a lot of pruning to ensure there is enough airflow to your plants. The lights are on a set cycle of sixteen hours on and eight hours off.

Features

- Space to grow up to 3 plants
- 13" (33cm) grow height
- No pump
- Three LEDs using 8W
- Float to indicate low water level
- No seed-starting system
- Features app support but no WiFi connectivity
- Cost $

SMART GARDEN 9, 9 PRO, AND 27

The Smart Garden 9 can grow the same maximum number of plants as the AeroGarden Bounty and has just a slightly lower grow height, but it is more basic. The plants are laid out in an offset pattern, and the unit measures 24" (61cm) long and 7" (17.8cm) wide. The Smart Garden 9 PRO has all the same features of the Smart Garden 9, but it also allows for a WiFi connection so you can control the light cycle through the Click & Grow app. With the Smart Garden 27 configuration, you get three Smart Garden 9s and a nice shelf to store them on. You can manually raise the light on each garden by adding extensions.

Features

- Space to grow up to 9 plants, or 27 with the Smart Garden 27 configuration
- 18" (45.7cm) grow height with both light extensions in
- No pump
- Nine LEDs using 13W (10,000 lux), with a set 16 hours on/8 hours off schedule

- Float to indicate low water level
- No seed-starting system
- Features app support but no WiFi connectivity
- Cost $$–$$$$

CLICK & GROW 25

The Click & Grow 25 is the biggest countertop model of the Click & Grow family and is best suited to growing leafy greens and herbs. It allows for a five-week succession planting schedule. You can stack up to three units and there are add-on kits and storage options available. While this system *can* grow other pods in the Click & Grow lineup, it's not recommended because this system is meant to be a leafy green succession planting system. It is designed to be used by adding one tray with five pods in week 1, then sliding that tray to the side in week 2 to add another tray with five more pods, and keep this up for five weeks. At the end of week 5, the first tray is ready for harvest, so you place it in the harvesting tray and cycle the remaining trays (inserting a new sixth tray). You keep the oldest pods at one end to avoid overshadowing new plants. If you were to grow plants other that leafy greens, it would throw off the cycle. Continually sliding larger fruiting

plants could cause them to fall over. That is not to say you can’t grow other things in this system, it was just purpose-built to always keep you in leafy greens!

Note: Click & Grow offers one larger model called the Wall Farm. It is their most expensive option and includes space to grow up to 51 plants. I prefer the three-tier Rise Garden because it is less costly, and if you really love Click & Grow systems and want to grow on multiple levels, you’d likely be better served stacking multiple Click & Grow 25s.

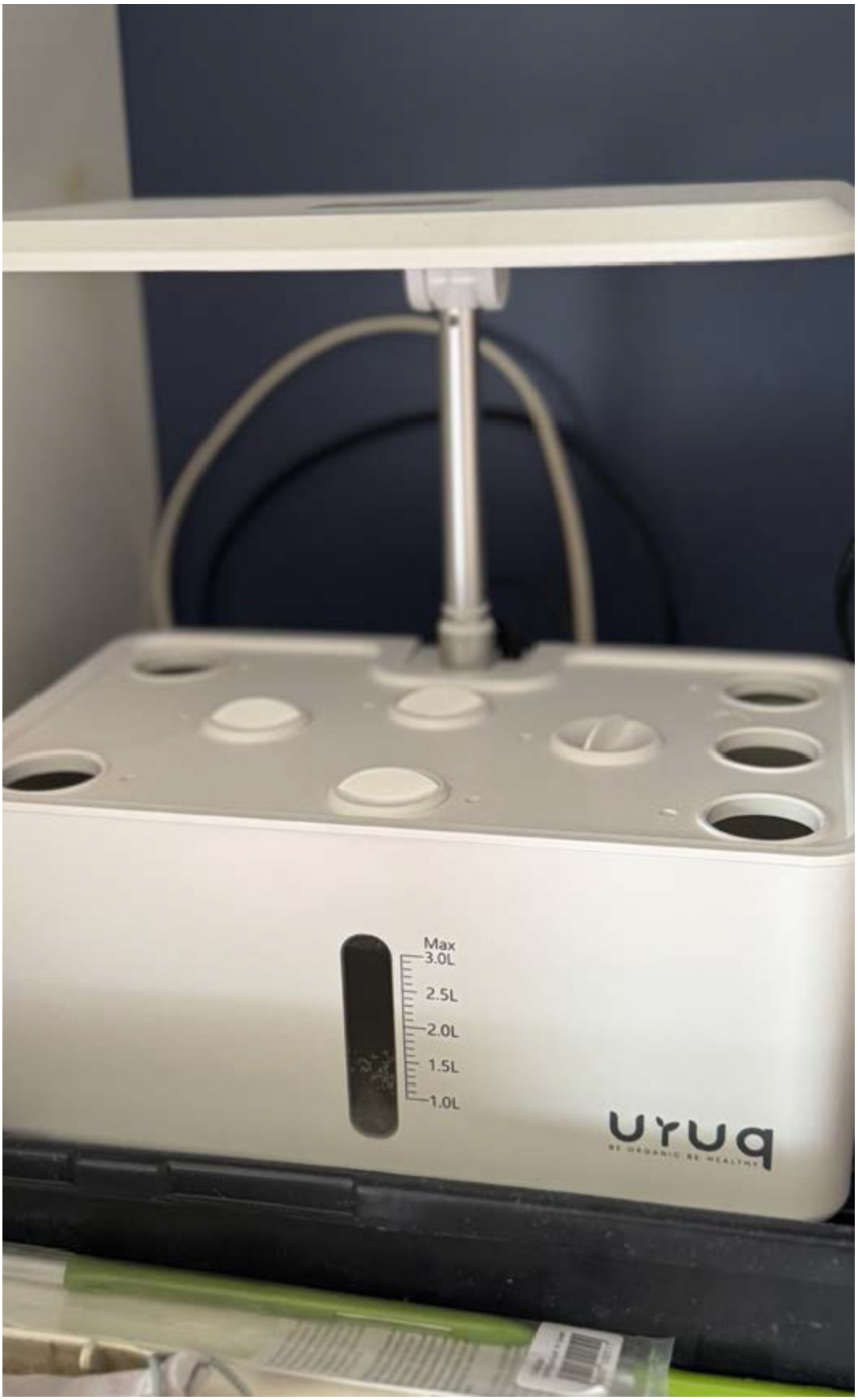
Features

- Space to grow up to 25 plants, in sets of 5
- 16" (40.6cm) grow height
- No pump
- Two LEDs using 16W
- Water level and humidity monitored in the app
- No seed-starting system
- Features app support but no WiFi connectivity
- Cost $$$

OTHER STORE-BOUGHT SYSTEMS

LetPot

The LetPot LPH-Max is one of the most upgraded of the new systems, offering a nice digital display and an accompanying app. This system has 21 holes for pods, but they also offer 10- and 12-pod versions.


Max
3.0L
2.5L
2.0L
1.5L
1.0L
uruq

URUQ is one of the newer brands getting into the countertop hydroponic system market. Many of these newer systems have more holes than is good for them, given their size. This one has twelve. Things look good at first, when you are putting in the pods, but as plants start to grow they can take up a lot of space. For example, in my AeroGarden Farm model that has space for twelve pods, I would only plant a single tomato or pepper plant.

LetPot and URUQ are two newer brands that I have some personal experience growing with, but they are by no means the only ones on the market. New options pop up every day, especially through online retailers. Other brands that are worth considering and researching are Lettuce Grow, Gardyn, Spider Farmer, Tower Garden, and Just Vertical. One catch with Lettuce Grow and Gardyn—they don’t yet ship to Canada.

CHAPTER 3 - PARTS OF A HYDROPONIC SYSTEM

Hydroponic systems are made up of many functional pieces (lights, supports, etc.) that come together to create a beautiful and useful living space indoors.

Sprout and my Click & Grow Smart Garden 3. Both models can grow a maximum of three plants, but the Sprout's reservoir can only hold about 6 cups (1.4L) of solution. The Smart Garden 3's reservoir can hold about 12 cups (2.8L) of solution! This shouldn't be the only element on which you base your decision, but it is another factor to consider when comparing models.

I also prefer a smooth-sided bowl with few nooks or crannies. The grow bowl is the main place in which your system could develop algae, and the harder it is to clean the more chance there is that the issue will come back. It’s important to understand the anatomy of a hydroponic system. While there are some differences between the various brands and even the units within each brand, there are overall more similarities than differences. Understanding how a system is constructed is important both for deciding which option is right for you and in making you more comfortable with your new indoor gardening tool.

Grow Bowl/Reservoir

The grow bowl or reservoir is where the nutrient solution resides, so size can make a big difference. The larger the grow bowl, the fewer times you will need to refill it. A perfect example is a comparison between my AeroGarden

The grow bowl or reservoir holds the nutrient solution and provides a space for your plant roots to grow.

AN EARLY NOTE ON NUTRIENT SOLUTIONS

You don’t want to mix your own nutrient solutions. This is specialized science/chemistry that requires lab equipment. Instead, you’ll want to evaluate the different nutrient solutions available on the market.

Any nutrients you use should be mixed with the right amount of water based on the manufacturer’s directions. The ingredients (and amounts of each ingredient) are going to vary from brand to brand.

You want to try different solutions, and choose the brand that works best for you and what you are growing.

Grow Deck

The grow deck is the top of the unit in which the baskets/cups sit. While it may seem basic, it can also play a big part in how and what you grow. As the grow deck contains the holes where the baskets sit, it limits how much you can grow. In the case of an AeroGarden Sprout, you can't grow more than three plants because that is the number of holes in the grow deck. This grow deck size limitation is true for most of the AeroGarden and Click & Grow models. Rise Gardens decks have increased flexibility—they provide interchangeable grow decks that can hold a minimum of four plants and a maximum of 12.

The grow deck also affects how easy it is to clean your system. AeroGarden Sprouts are easier to clean because of their relatively smooth grow decks. The Harvest, Bounty, and Farm models are more complicated, so they're more difficult to clean. To deliver the nutrients to each grow sponge via drip holes, these models have grow decks that are made in two pieces. Trying to get these grow decks apart is difficult and time-consuming. Click & Grow models have one-piece grow decks, but they feature many nooks and crannies that can attract algae and be difficult to clean. Rise Gardens grow decks are very smooth, so they are a breeze to clean.

AeroGarden has the most heavy-duty lifting grow deck, but it is also the hardest to clean properly since you have to take the two sections apart.

I love the simplicity of the Rise Gardens grow decks. They are available in different configurations, but every version is smooth and easy to clean.

Grow Light

The grow light is where a lot of the magic happens—hello LEDs! Gone (for the most part) are the days of clunky, hot, and huge incandescent or fluorescent grow lights. LED stands for “light-emitting diode,”—LED lights last a *long* time, don’t get hot, and use minimal energy. Note that if you are buying a stand-alone grow light, the LED options may be a bit more expensive up front. They’re truly a worthwhile investment, though.

If you have only ever tried growing on a windowsill, you’ll be amazed to see the difference in your plants when you switch to growing them under a proper grow light! They will be less leggy, greener, and altogether happier and healthier!

Full-spectrum grow lights are very important for the health of your plants. They fill the role usually held by the sun, providing the plants with the light they need for photosynthesis.

GROW LIGHT TERMS TO KNOW

- **Lumens**—A lumen is the unit used to measure the brightness of a light to the human eye. This is more applicable to indoor home lighting rather than plant lighting. When I first started upgrading my indoor growing accessories, I mistakenly bought a LUX meter thinking it would help me measure the strength of my grow lights. Spoiler alert: it didn't.
- **Photosynthetically active radiation (PAR)**—PAR is the portion of the light spectrum that plants leverage to grow, so it's one of the most important values to consider when choosing grow lights.

- **Light color**—Most systems have a combination of white, blue, and red LED lights. Make sure the LEDs in your system or stand-alone grow lights are full spectrum and that they emit both cool and warm light. They must be able to mimic sunlight, which leads to healthier, stronger plants.
    - Blue light encourages vegetative and structural growth, leading to bushy leaves and strong stems and roots.
    - Red light promotes flowering and fruiting as well as stem elongation and leaf growth.
    - White full spectrum light will take care of most growing needs.
    - Blurple light is a type of lighting created by using blue and red diodes to create a pink/purple glow. They combine the benefits of blue lights and red lights but can be hard on your eyes.
- **Watts**—If you are very energy conscious, you will want to pay attention to the watts used by your systems or stand-alone grow lights. All grow lights or systems should provide information about how many watts of electricity each needs to operate.
- **Photosynthetic photon flux density (PPFD)**—PPFD represents how many photons per second a light produces, which corresponds to the amount of plant-usable light that will reach the plants. A lower rating of 100–200 may work for leafy greens and seedlings, but fruiting plants need a higher 400–500 rating.

There is quite a big difference in the size and shape of the grow baskets used in the three main brands. Shown from left to right are AeroGarden, Click & Grow, and Rise Gardens grow baskets.

Click & Grow also offers pro cups, which are bought separately from the main system. Because they're perforated, they allow the roots to reach down into the water.

Grow Baskets/Cups

Grow baskets or cups are what help keep your grow pods (and plants) suspended above the nutrient solution. The baskets fit into the holes in the grow deck and hold everything in the right place. Typically, they will have many holes for the roots to pass through and reach down into the nutrient solution. The one exception of all the systems I've used is Click & Grow. Their normal grow cups, which are about the size of a small yogurt container, have no holes or openings. They have since released "pro" cups, which do have small slits in the side to allow the roots down into the reservoir. All the available grow baskets are reusable and last a long time, especially the tough ones provided with Rise Gardens systems.

Grow Pods/Sponges

The major brands all offer preseeded grow pods and seedless grow anything grow pods/sponges. As with anything, there are pros and cons with each.

Shown from left to right are Click & Grow, Rise Gardens, and AeroGarden grow pods.

TIP:

> It’s a good practice to store all grow pods (and even regular seed packages) in a vegetable crisper or another cool, dry place. The cooler temperatures help your seeds stay viable for longer.

CLICK & GROW

Click & Grow pods have enough nutrients for four months of plant growth and aim to distribute water evenly. They are made from coco coir and peat with additional nutrients including nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), and microelements. These are suspended in the smart soil in the form of slow-release nutrient balls of varying colors (red, green, and beige). The seedless pods they offer that are optimized for fruiting plants are supposed to contain more nutrients than their regular seedless pods, but they don’t specify the amounts or provide much detail.

They recommend storing their pods in cool and dry conditions at a temperature around 78°F (25.6°C). They can be stored in these conditions for up to one year. After this time, it does not mean that the preseeded ones will not grow, it just means you will likely have less germination. It is always best to order pods when you need them rather than keep them in storage for long periods of time. These are the largest of the branded pods with a diameter of 1 ¾" (4.5cm) at the top and a height of 1 ¾" (4.5cm).

The Click & Grow preseeded pods (left) come with the seeds already in the grow pods (although they are placed very deep and can be hard to see). They offer regular seedless pods and seedless pods that are optimized for fruiting plants (right).

Click & Grow pods are sold in packs of three or nine.

RISE GARDENS

The Rise Gardens grow pods are a 100 percent organic mix of coco coir and peat moss meant to support both early growth and continued growth. As

part of their manufacturing process, they dry the pods so that they are sterile, ideally reducing the chances of pests being brought in with the pods. In preseeded pods, germination rates drop after a year and some seeds like onions drop off significantly. I think it’s worth trying to grow from older pods rather than throwing them away. If nothing sprouts, you can always add a new seed to the pod. These pods are 1 ¼" (3.2cm) wide at the top and 1 ¾" (4.5cm) tall and have a nice divot in which to place the seeds. These are my favorite pods, as the divot makes it easy to ensure seed placement, even with larger seeds.

The preseeded pods from Rise Gardens are the only ones where you can actually see the seeds if you take off the foil. If you do this, be careful, as they don’t “stick” their seeds down—you could easily dump out the seeds. You should also immediately put the foil back on when you’re done.

Most of the preseeded Rise Gardens pods come in packs of four, but there are few varieties that come in twelve packs.

AEROGARDEN

The AeroGarden preseeded pods, like the Click & Grow pods, expire after one year, but again, it doesn't mean that they won't grow after that date—the germination amount might drop after that period. The seedless sponges are made of Canadian sphagnum peat moss, so they can last a very long time. These are the longest and narrowest of the branded pods at ¾" (1.9cm) wide at the top and 2 ¼" (5.7cm) long. The hole where the seed sits can be quite deep, making it a bit harder to ensure the seed is securely in the hole. When dealing with large seeds, you may need to cut the side of the pod to insert the seeds.

The AeroGarden preseeded pods (on the right) come assembled, with the grow sponge and seeds packed into the basket and the green sticker already attached. The seedless pods are shown on the left.

AeroGarden offers the skinniest grow pods of the three main brands. They are also the longest.

I prefer to grow my own seeds, so I invest in bulk bags of AeroGarden grow sponges to make sure I always have a good supply on hand.

Other Growing Mediums

If you don’t like the idea of using proprietary grow pods/sponges, you can always use your baskets to hold other types of growing mediums. You could easily switch them out for 100 percent coco coir, LECA pellets, perlite, vermiculite, mineral wool, or sphagnum moss. All these options may feel overwhelming, so let’s take a look at what each of them is and why they may or may not be a good option for you.

COCO COIR

Coco coir is a sustainable growing substrate made from fibers extracted from coconut husks. It’s usually sold in compressed format, shaped like a cube, rectangle, or circular puck. You need to place it in a larger container, then hydrate it by adding water a little at a time. Start slowly at first as you don’t want to add too much and turn it into a soup! I can’t overstate the importance of putting it in a container much larger than you will think you need—it will expand a lot once you add water!

Coco coir arrives compressed. You'll need to slowly and carefully hydrate it in a larger container.

LECA PELLETS

LECA stands for "lightweight expanded clay aggregate" and these pellets are little round balls that are also referred to as "clay pebbles" or "hydroton." Much like coco coir, they are known for having good water retention, few pests, and good aeration for roots. They are created by heating pretreated clay in a kiln and allowing it to cool. They can be reused many times, which is a definite benefit. In my experience, they are better suited to the 3" (7.6cm) net pots (the larger generic pots that can be used in homemade systems) than smaller standard grow baskets. They are widely available and easy to find.

LECA is a great option for larger 3" (7.6cm) grow baskets in homemade hydroponic systems, 3D-printed grow decks for store-bought systems, or in Kratky jars (see here).

PERLITE

If you have ever seen potting soil, then you have seen perlite. It is the hard little white chunks you find in most potting mixes. Perlite is actually a volcanic glass that is formed from obsidian when it attracts moisture from the surrounding environment. This changes the chemical structure, and when it is heated to very high temperatures (1800°F [982.2°C]), it expands and forms the small white chunks we call perlite. Like most of the other mediums we are looking at, it is sterile and nontoxic—perfect for growing food. It is reusable, but it is not biodegradable. Perlite has a neutral pH, and its porous nature allows for good drainage and air circulation (both crucial for healthy roots). The granules can be a bit dusty, and they are small, so you should rinse them well before putting them into the grow baskets. This will eliminate the dust and help remove any really small pellets that might clog pumps. Bonus: After rinsing, you can use the runoff to water your regular houseplants, passing along the perlite benefits.

Perlite can be harder to contain since it is so small. Be careful using it in systems with pumps to prevent anything from getting clogged.

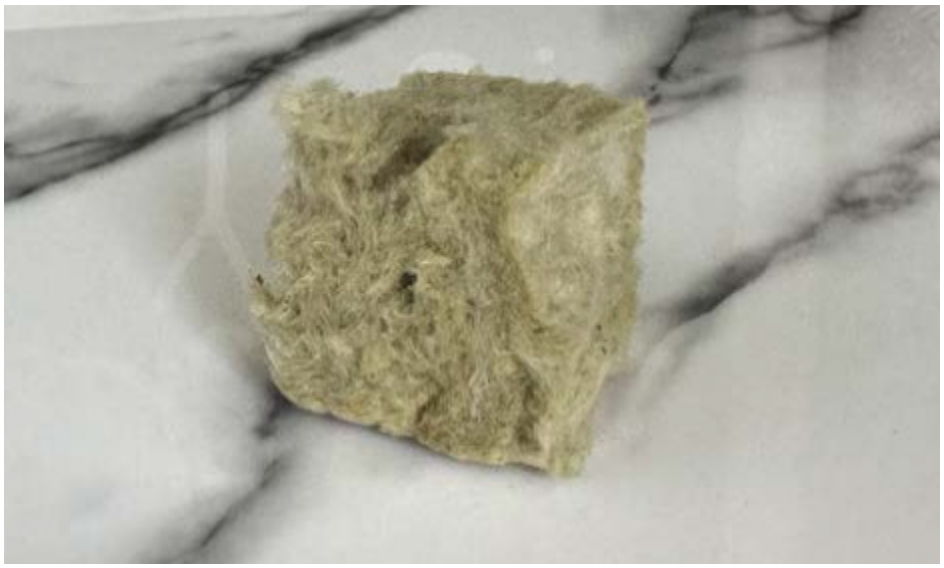
VERMICULITE

Vermiculite is a naturally occurring mineral that is mined, exfoliated, and heated to high temperatures to make it expand. It has the impressive ability of being able to absorb up to four times its weight in water. This also has a downside—it can hold too much water, which means it doesn’t have great aeration. This can lead to root issues, so if you choose to use it be sure to keep an eye on those roots. Because it is made of small pieces, you have to be careful that your pump doesn’t get clogged. It has a neutral pH and the ability to attract nutrients like calcium, magnesium, and potassium.

Vermiculite is chunkier than perlite, but it is also grittier—so it can still pose an issue for systems with pumps.

MINERAL WOOL

Mineral wool (also known as rock wool or mineral fiber) is made from melting slag and basalt rock and then spinning it into fibers. It is most often used as an insulation product due to its fire protection, soundproofing, and insulation properties. But it has also found a place in the world of hydroponics, and it is probably the most cost-effective of any of the alternative growing mediums. You can get around 200 cubes online for about $14 US. That’s pennies per plant! It is inert, which can help keep things like mold, diseases, and pests at bay. Mineral wool cubes need to be soaked in water, as they are more alkaline, with a high pH of around 8.0. I don’t often use it because I dislike the texture. It can also irritate your eyes, skin, and lungs, so I suggest wearing a mask and gloves when working with it. Mineral wool also isn’t easy to reuse, and it’s not biodegradable or compostable.



You may want to wear gloves when handling mineral wool, as some people find that it irritates their skin.

SPHAGNUM MOSS

Sphagnum (peat) moss is dried organic material sourced from a variety of dead mosses. It is a bit acidic and retains a lot of water, which could be problematic for most plants. You also have to be careful that pieces don’t break off and clog the pump.

Be careful using materials that have pieces that could break off into your system.

Pump

While you don't *need* a pump in a hydroponic system, it sure does help! A pump can help circulate the nutrient solution to avoid it getting stagnant and to add air into the mix, and it can be physically built into the functionality of the system. For Click & Grow models, there isn't a pump in sight—they are built on a kind of wicking/Kratky system (see here) depending on the cups you use, so pumps do not factor into the equation. AeroGarden systems (with the exception of the Sprout) use a pump to circulate water and push it up and through the grow deck to feed the drip system. Pumps in Rise Gardens systems (with the exception of the Personal model) work the hardest as they are built around nutrient film technology. They must pump the water up through three tiers so that it can filter back down to the reservoir.

I much prefer systems in which the water is constantly in motion, though it does come with a potential downside. If the pump breaks, then everything stops! This isn't as big of a problem in systems like AeroGarden's, where the pods and roots still reach down into the entire reservoir and nutrient solution. But in systems like those made by Rise Gardens, very little water will remain in the trays without the pump. Plants can easily use this small amount up very quickly, especially if they are larger. Very small plants that have roots that haven't yet emerged from the pods are even more at risk since they can't "reach" for any remaining water as the level starts to drop.

I like to be prepared, so I always keep a backup pump on hand for my systems. It's one of those things that you don't need until you need it, but once you need it you will thank yourself! There is nothing worse than looking at a thriving garden full of nutrient-dense food and watching it wither away as you wait for a new pump to ship!

Depending on the system you're using, a reliable pump is key, especially if you need to get water to upper levels (like in the tiered Rise Gardens).

Domes

Domes are often overlooked or forgotten, which is a shame since they are small but mighty! Seeds, on average, need about 60 percent humidity to germinate. Domes are a key tool, helping to increase the humidity and

increase your chance of germination. It is best to remove the domes as soon as you see the

first set of leaves appearing on a plant. In truth, domes can come off as soon as you see that the seed has germinated, but (especially if you're new to hydroponic growing) the leaves are the surest sign. If the delicate new leaves touch any condensation (water droplets) that might be inside the dome, it can burn them. The water acts as a magnifying glass and causes damage to the most vulnerable small plants. Just remember to set the removed domes aside to save them for use in your next growing cycle!

The AeroGarden domes are designed to fit onto their grow baskets. Since AeroGarden has switched from iron-on covers to stickers, the domes fit a bit looser.

The Click & Grow domes have an old-school UFO look to them. They fit snugly around the covers.

AeroGarden used to make iron-on covers that were a bit sturdier, but now they provide more convenient stick-on covers.

Click & Grow uses reusable plastic covers that are a nice alternative to the disposable ones offered by AeroGarden and Rise Gardens.

Light Blockers

When I refer to “light blockers” (for lack of a better term), I mean the cover that sits on top of the grow pod. For AeroGarden systems, they are green stickers with a hole in the middle. For Click & Grow systems, they are white, click-on plastic covers with U-shaped cutouts, and for Rise Gardens systems, it is a foil wrap with a doughnut-shaped sticker on top. While the approaches are different, the goal is the same. These covers allow the plants to grow through while preventing as much light as possible from reaching the grow pods/sponges. They prevent the potential for algae blooms.

With the snap-on lid, the Click & Grow approach is the clearest for showing those new to hydroponic gardening that these cover pieces are meant to remain in place. Many people make the mistake of removing the

stickers or foil, thinking their plants will not be able to make it through. The plants can definitely make it through, and removing the foil or stickers can lead to algae blooms.

Rise Gardens keeps it simple by just covering the grow pods with a foil covering that should not be removed.

I love that hole covers are provided with Rise Gardens systems by default. AeroGarden makes them, but they must be searched for and purchased separately. Click & Grow does not have any hole cover options available.

Kiri you are doing your part!
Take a peek at your stats and find out how you made a difference for your home and the planet.
134
Pounds Grown
3,629
Gal. of Water Saved
144,560
Food miles Saved
109
Plants Harvested

The Rise Gardens app shows me helpful stats about my whole growing process!

Hole Covers

Hole covers are often overlooked, but they're so important for keeping dreaded algae at bay. Hole covers should honestly be included with every system! Any time you have light, nutrients, and water together (so pretty much any hydroponic gardening system), it's a recipe for algae.

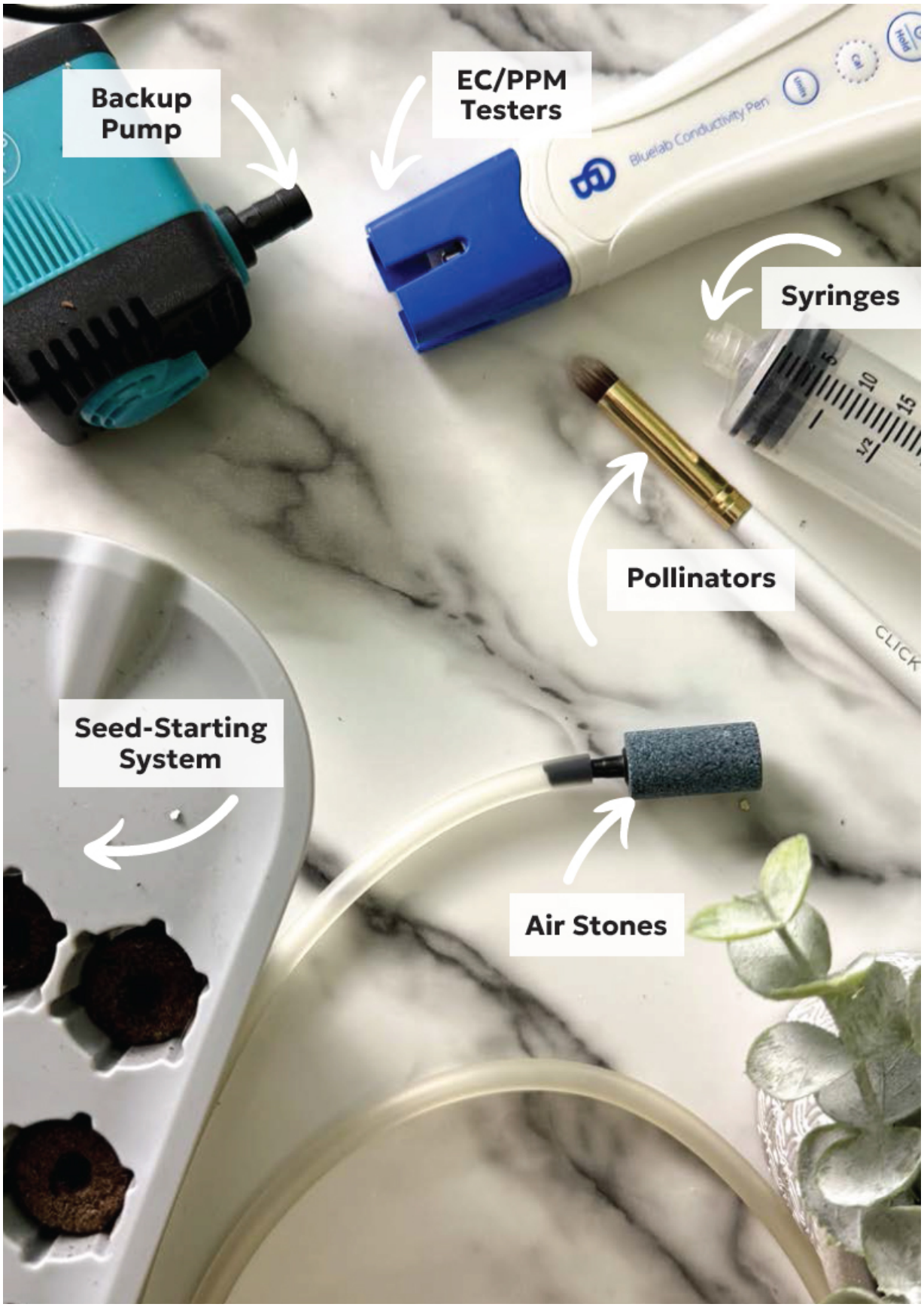
To keep algae at bay, you have to disrupt the LIGHT + NUTRIENTS + WATER = ALGAE equation. The easiest method is to block any open holes in the grow deck to keep extra light from reaching the nutrient solution. Both AeroGarden and Rise Gardens make branded covers, although Rise Gardens comes out on top by including them with their systems. You don't have to stick with stock options—many creators sell 3D-printed options online. A low-cost solution for AeroGarden systems is to use golf balls, as they fit in perfectly to block the holes. In my Click & Grow Smart Garden 3, I use an inexpensive terra-cotta garden pot base that fits in nice and snug. It doesn't matter what you use, as long as it is opaque and fits snugly.

App/Interface

While an app or interface program isn't entirely necessary, nor a physical part of the system, a well-designed app can be so helpful. The statistics and controls included help you maximize your growing experience. Some are better than others, of course, and the only one that I have ever used consistently is the Rise Gardens app.

CHAPTER 4 - WHAT EXTRA ACCESSORIES DO YOU ACTUALLY NEED?

Other than a pH tester and possibly an oscillating fan, you don’t entirely need any extra accessories, but they can make things a lot easier and help you increase your harvests. Some people love having all the bells and whistles and find that it makes things easier and more fun. I recommend sticking to the basics at the start and then adding on accessories as you find a need for them. You can gradually add complexity as you get accustomed to growing food hydroponically. The accessories here, listed in no particular order, are those you’ll want to consider once you progress on your gardening journey.


Backup Pump
EC/PPM Testers
Bluelab Conductivity Pen
Syringes
Pollinators
Seed-Starting System
Air Stones

The truth is you don’t actually need any of these accessories, but they can make your life easier and your gardening journey more successful and rewarding.

Structure and System Accessories

Without soil, you need to find other methods of supporting your plants and keeping them upright and healthy. You also need to care for the water and nutrient elements of the system and guard against any unexpected emergencies. These accessories improve the base system and help make them more functional and easier to maintain and clean.

TRELLISES/PLANT SUPPORTS

When growing tall plants, such as tomatoes, peppers, dill, and eggplant, trellises or plant supports are key to helping your plants stay strong and not topple over when laden with fruit. The same is true for climbing plants like cucumbers or peas. AeroGarden and Rise Gardens offer brand-name trellises, but you can also take a DIY approach and use toilet rolls or pool noodles to support tall plants. There are also many 3D-printed options available online. Just remember that without the soil to act as a base for the root structure, plants in a hydroponic environment are more prone to tipping. Make sure your trellises securely attach to your system to provide the right amount of support.

If you want to grow things like peas or cucumbers, a trellis is a great idea. These types of plants like to climb and benefit from having something to grab onto.

PLANT/GARDEN STANDS

In reality, any shelf can function as a plant stand, but the main brands all sell their own branded shelves and supports. I have never bought the AeroGarden or Click & Grow options, as my units have been growing well for years on countertops, desks, and shelving units. If you want to have all your units in one place (and especially if you have any longer units that might not fit well on another unit), these stands can help keep things organized.

Once these supports are attached, they don't move, a plus with heavy plants.

The Rise Gardens plant supports fit securely under the edge of the grow baskets.

WATER JUGS

I used to save and fill up the large water jugs from the grocery store, but they were always impractical and unruly to pour into any of my hydroponic units. You will continuously need to top off the water in your system, and depending on the size of the unit you use, it won't be practical to take it back and forth to the sink. I have a 1 gallon (3.8L) AeroGarden jug that I now swear by. This jug has a handy spout on it that makes life just a little bit easier. You could use a watering can with a long, narrow spout. I also love the custom lids that fit on mason jars and turn them into pouring jugs.

Amber jars are particularly useful since they can block out the light. They're great for premixing solutions for use with my hydroponic systems or even just for my houseplants.

I mostly use tap water in my systems, so it's helpful to have a jug I can fill up and leave so that any chlorine will evaporate off. The pouring spout makes life easier, too.

BACKUP RESERVOIRS

Backup water reservoirs can be game changers if you are going to be away from your plants for a few days. While there *is* an AeroGarden-branded option, the AeroVoir, you can also fashion your own backup reservoir. See the sidebar below.

AeroGarden's AeroVoir is especially helpful when plants are growing larger and using water seemingly faster than you can add it to the regular reservoir. It's also a quick visual reminder of the water level.

SETTING UP BACKUP RESERVOIRS

If your system runs out of water very quickly (which can happen as plants grow), consider adding a backup reservoir. My go-to is a gravity-fed reservoir, which can be added in a few different ways.

The Simple Option

If you want to go the simple route, all you need to do is get yourself an empty, clean wine bottle (or something similar). Fill it with water and invert it quickly and carefully into one of the open holes.

The In-Depth Option

If you want to create a more in-depth DIY setup, you can build your own gravity-fed backup reservoir quite easily. Before you begin, figure out where you are going to place the reservoir. In this type of system, the water in the backup reservoir will want to equalize with the water

level in the grow bowl. **Do not** place this reservoir above the water level you want to maintain in the grow bowl.

FIRST, GATHER THE FOLLOWING MATERIALS:

- **An opaque tote/bin with a lid**—Be sure to use an opaque container rather than a clear one.
- **Tubing**—You will likely need tubing with ¼" (6.4mm) outer diameter and $^{3}/_{16}$" (4.8mm) inner diameter. Be sure to measure the hole in your unit that you'll be using to feed the tube in. The holes on the decks of the AeroGarden units are usually ¼" (6.4mm) in diameter.
- **Silicone rubber grommets**—Match the inner diameter of your grommets to the outer diameter of your tubing.
- **Drill with a ⅝ "** (1.6cm) **drill bit**—You need a tool to carefully make the hole in the tote. Match the tool to the size of the rubber grommets to ensure a tight fit.
- **Masking tape and a marker**—You'll use tape and a marker to mark the location for your hole.

An inverted bottle is the simplest version of a gravity-fed backup reservoir.

Then, follow these steps to create your backup reservoir:

1

Make the hole for the grommet. Decide where you want the hole to be, then mark it. Confirm your tool is the correct diameter to match the grommet and drill. Be careful, go slowly, and don’t apply too much pressure (you don’t want to crack the container).

2 **Insert the grommet into the hole.** This was a task and a half! It is important to make sure that the grommet is completely snug against the outside of the tote. Be gentle but firm (you don’t want to risk cracking your container).

3 **Position your reservoir.** As noted above, make sure the backup reservoir is at the correct height to avoid overflowing. *Note: I placed my reservoir on the table beside my AeroGarden Sprout.*

4

Insert the tubing. Empty the grow bowl first to avoid any spills, then remove the small plug from the grow deck (and place it in a safe storage space for later use). Insert the tubing into the grow deck, then determine how long it needs to be to reach into the reservoir a few inches. Cut the tubing to length and insert it through the grommet.

5 **Add water to the system.** Slowly add a bit of water to the backup reservoir. You may need to lift the reservoir slightly at first to get the water to start flowing into the grow bowl. Once you see water coming back out of the tubing, place the backup reservoir back down. Continue to slowly add water to the reservoir until the water level stabilizes in the grow bowl. If you go too fast, the system could overflow. Once the level is stable, check for leaks from the grommet. Finally, put the lid on the reservoir.

WATER CHILLER

Nutrient solution temperature is important in hydroponics, as it can affect the pH level, electrical conductivity (EC) of your water, amount of dissolved oxygen that's present, and ease with which pathogens can take hold. The optimal root zone temperature ranges between 65°F–70°F (18°C–21°C). If the nutrient solution temperature rises above this, it can have negative impacts on your plants' health. Warm and oxygen-poor

environments are a breeding ground for pathogens like *Pythium* (root rot) that can kill off your plants before you even realize it is there, and environmental stress can make it difficult for your plants to take up nutrients. If you notice that your system's temperature is consistently higher than the ideal range, a water chiller may be a good addition to help keep the root zone temperature at ideal levels and prevent plants from overheating.

Full disclosure: Water chillers are *not* cheap, and I personally wouldn't bother putting one in any of the current AeroGarden models. I considered getting one for my Rise Gardens system, as it has a much larger water tank, my grow room is quite warm, and the water in the top tray runs on top of the bottom light. Instead, I've added a "waterfall" aquarium pump on the side of my reservoir and a cooling fan to blow over the surface of the nutrient solution. This is an experiment, so I'm not sure yet how effective it will be for my situation, but both of these together are still much cheaper than a water chiller. Unless your water temperatures are sky high or you are consistently seeing negative effects in your plants, a water chiller is probably not necessary.

Some people like to add ice cubes or frozen water bottles into their grow bowls, especially if they are growing leafy greens. I haven't personally tried either of these techniques, and I would worry that they would be a bit "hit or miss" in terms of the temperature consistency, but it is another method that can be experimented with if you're looking for other temperature-control options.

STEAMER

A steamer will level up your cleaning game. It is a great tool to use after the manual cleaning is done. It will get into any nooks and crannies and blast away tough grime and algae. Even if there is no visible dirt left after my manual cleaning, I still like to give the whole system a once-over with the steamer just in case there is anything nasty hanging about. A good blast of hot steam helps keep everything in check.

This is one of the newest tools in my toolbox, and I love going over my systems with it after I've given them a good cleaning. The steam gets rid of anything I may have missed.

TUBE CLEANERS

I never considered buying a tube cleaner until I got my first Rise Gardens system, as that is the first system I have used that includes tubing. Cleaning this tubing can be an ordeal, so any tools that can help are worth their weight in gold. They're easy to find online, just make sure to pick one that is long enough to clean the whole tube whether in a single pass or in two passes from either end that overlap in the middle. You don't want to end up with one dirty spot you can't reach.

Before I purchased my tube cleaner, I would just run very warm water through the tube to make it more pliable and then kind of rub or crush the two sides of the tube together to loosen any residue so it could be washed out. This was a difficult and error-prone process. Some people may opt to just replace their tubing if it gets really dirty, which can be inconvenient and

pricey over time. Tube cleaners aren't 100 percent necessary tools, but I am always grateful I have mine when it's time for a deep cleaning.

If your system has tubes, I strongly suggest investing in a tube cleaner. It doesn't look like much, but I wish I had purchased one of these years ago.

BACKUP PUMP

I learned the hard way that it is a good idea to have a backup pump, *especially* for large systems. You never know when things can go wrong. There is nothing worse than watching your plants slowly die because the pump has broken, and you have to wait for a replacement (whether because you need to find the replacement first, the part is back-ordered, or the shipping is delayed). I experienced this with my two-tier Rise Gardens system, and it was so stressful trying to get a replacement quickly enough to avoid losing any plants! I now keep a few spare pumps on hand for my larger systems, just in case. They are easy enough to find online and most are reasonably priced. AeroGarden also offers replacement pumps for sale on their website.

The last thing you want is a system full of beautiful, healthy plants and a broken pump. Having a backup pump is insurance in case something goes wrong.

PHOTO STORAGE CONTAINER

Hear me out: The necessity of a photo storage container will directly correlate to the size of your seed "problem." In my case, I needed more than one container! These cases are created to store and organize photos of different sizes. Each larger case includes smaller boxes meant to organize your cherished memories. They're perfect for storing and organizing collections of seed packets.

If you are buying preseeded pods, this specific accessory will likely not be useful to you. But if you plan to use growanything pods and have an overabundance of seeds on hand, one of these containers can be a lifesaver. This tip is also useful if you have an outdoor garden—they're very helpful if you're direct sowing and want to carry your seed packets out to the garden and keep them protected from the elements.

Photo storage containers are a great way to organize and store your seed collection. As an added bonus, you can use them to show off any garden stickers you may have.

Data Accessories

With hydroponic gardening, the more information you have about the water you're using, the better. The following tools are integral to knowing if you need to add anything beneficial to your system or mitigate any negatives.

You can keep it simple and choose a lower cost pH pen, just make sure you are testing your pH levels.

If you want to invest a bit more into your system, a Bluelab pH Pen is worth the extra cost.

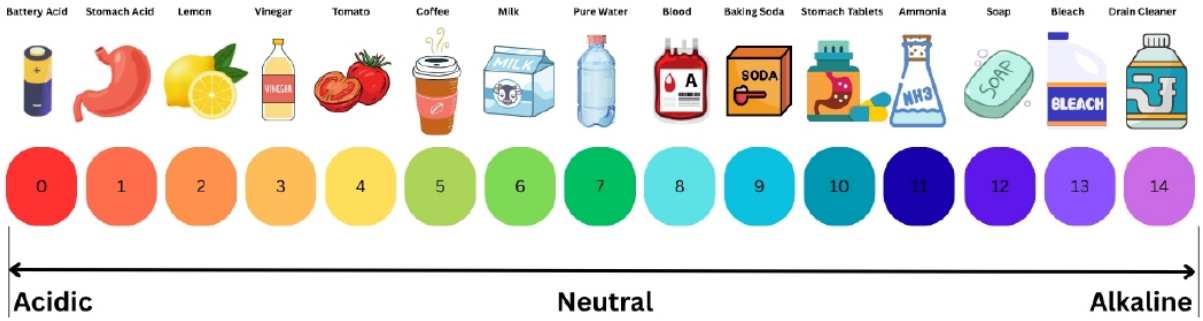
pH TESTER

A pH tester is something every hydroponic grower should have, but oddly, most store-bought units don't provide or even really mention them. If you don't test your nutrient solution, you will miss a vital piece of information that directly impacts your plants' health. Knowing the pH of your nutrient solution is key to the success or failure of your harvest. If your pH level is too low or too high, it can easily kill your plants outright or make them more susceptible to pests and diseases. A weak plant is a vulnerable plant.

As with most things in this world, you can find low-cost and expensive pH testers. Since this is such an important tool, I recommend spending the money on a quality tester. As long as they are well cared for, they can last you a long time. My personal favorite is the Bluelab pH Pen, since it's portable and ticks all the right boxes for my system. If you don't have the budget for the Bluelab options, then buy the best at the level you can afford.

For example, Root Farm makes a testing kit that's usually priced around $10. It doesn't matter how fancy your pH tester or kit is, what matters most is that you *are* testing your nutrient solution.

pH REFERENCE CHART



I TESTED MY SOLUTION—NOW WHAT?

It is key to test your pH, but that is only step one. Once you know what your pH is, you also need to know how to bring it back into the ideal range. This is where the products pH Up and pH Down come into the mix. No matter which you need, both must be used sparingly. It is best to only add a few drops at a time (I use individual small 10mL syringes for each that are clearly labeled). Since these are strong chemicals, you should use caution. They can cause skin irritation in some people, so gloves are a must.

Here's a quick reference:

- pH Up—This is a base/alkaline solution (often potassium hydroxide or potassium carbonate) that is used if the pH of your nutrient solution is too low.
- pH Down—This is an acid solution (often phosphoric acid) that is used if the pH of your nutrient solution is too high.

Having a less-expensive EC testing pen is way better than not having one at all. You have to weigh the value of investing in a quality model that will last longer or having to replace your pen more often.

EC/PPM TESTERS

Electrical conductivity (EC) is important, as it is another way to measure the nutrient concentration present in your nutrient solution. You can monitor it to make sure everything is within the range that leads to optimal plant growth and avoids nutrient deficiencies or toxicities. See here for more detail on EC.

A parts-per-million (PPM) tester/reader measures the concentration of total dissolved solids (TDS) in the nutrient solution. Doing this helps you ensure that the nutrient solution is properly balanced, and this data will also help you fine-tune your solution if the results are outside the ideal range.

A pH tester should be your priority, so be sure to buy one of those before you worry about an EC and/or PPM tester. These will give you valuable data, but pH is more important as a starting point. Once you have a large enough budget and are actively testing your pH, you can add an EC and/or PPM tester to your arsenal.

My first EC testing pen was a cheaper model. I ended up frustrated with it, so I coughed up the money to buy one of the Bluelab models.

Plant Germination and Care Accessories

There are many accessories that help with growing and maintaining your plants. Whether they are tools that help protect and grow plants when they’re at their most vulnerable or tools that will provide optimal growing

conditions, they are definitely items you'll want to consider adding to your collection before you begin

SEED-STARTING SYSTEMS

The major brands don't all offer dedicated seed-starting systems for their units (but I wish they did). It is such a great way to start a bunch of seedlings for your outdoor garden. I have used this method many times, and it is especially handy if you are running late in your planting schedule. Plants grown hydroponically grow faster than seeds started in soil, so it gives you a bit more flexibility. AeroGarden has the best options for seed-starting systems. The one I had for my AeroGarden Farm model allowed me to start 85 pods using only one side of the unit! They also sell seed-starting systems for the Sprout model (it holds 15 pods), the Harvest model (it holds 23 pods), and the Bounty model (it holds 50 pods). While Rise Gardens doesn't have a dedicated seedstarting system, they do offer a top plate that holds 12 pods that could easily pair with seedless pods for this purpose.

If you also have an outdoor garden, a seedstarting deck is a great investment. You can start a lot of seeds in a small space and then move them over to soil to plant outside.

MICROGREENS ACCESSORIES

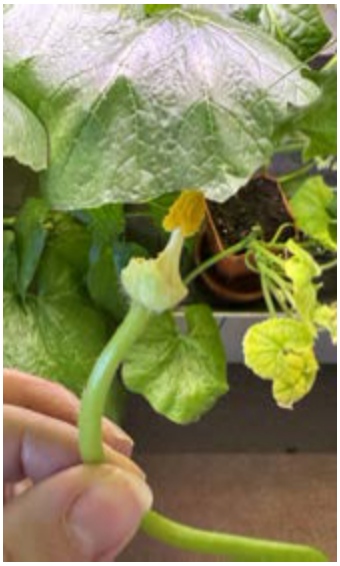
If you like microgreens, these are great products. They won't have you selling microgreens as a side hustle, but they will keep you stocked up should you want a small personal supply. For the Rise Gardens systems, they have preseeded microgreen pods (so it's not really an accessory, just a separate pod option). Click & Grow does not offer any kind of microgreens. AeroGarden offers a microgreens kit that is compatible with the Harvest and Harvest Elite and another that is compatible with the Bounty, Bounty Basic, and Bounty Elite models. Both versions are split into two trays, so it is easy to grow two types of microgreens at once.

Rise Gardens sells microgreen pods that come loaded with seeds. AeroGarden also makes a full microgreen tray insert for the Harvest and Bounty models that can grow quite a lot.

POLLINATORS

Whether you need a pollinator will depend on what you want to grow. If you only plan to grow herbs and leafy greens, you will have no need for one. However, if you want to grow things like tomatoes, peppers, or eggplants, it's definitely worth considering. If you want to try your hand at growing cucumbers (with the exception of parthenocarpic varieties, see here), melons, or squash, it is a must!

Plants like tomatoes and peppers are essentially selfpollinating because their flowers have both the male and female parts in the same blossom. This means that you will get fruit even if you don’t do anything. However, if you *do* step in with a bit of manual pollination, you can increase your harvests. You do need to manually pollinate melons or squash, as these plants have separate male and female flowers. There are many low-cost options, including softbristled paint brushes, the male plants themselves, or even an old electric toothbrush. AeroGarden makes a small vibrating pollinator (with a cute bee theme), and Click & Grow offers a more basic paintbrush-style pollinator. Any of these options will work, and I usually tend to reach for my paintbrush, which I also use in my outdoor garden! This is a tool where there’s no need to overcomplicate anything.



Pollinating can be as simple as peeling the petals off a male flower and using it like a paintbrush. Just be careful when removing the petals that you don’t knock a lot of the pollen off.

Who doesn't love a cute buzzy bee? The AeroGarden pollinator wand helps to pollinate flowers by adding a bit of vibration that causes the pollen to be released.

The Click & Grow pollinator is essentially just a paintbrush, and any soft-bristled paintbrush will work fine. The Click & Grow option does have the advantage of a small, comfortable handle and short, very dense bristles.

PRUNERS

A good set of pruners is a great investment for all types of gardens. Pruning helps reduce the risk of disease, increase airflow, increase productivity, and keep things looking neat and tidy. The most important thing to keep in mind

is making sure that your pruners are sharp! This is key to making clean cuts when pruning, which greatly reduces the risk of introducing diseases. I have a pair of the AeroGarden-branded pruners, which work well, but my favorite are my Fiskars pruners! Find a set that you like that are sharp and within your budget. See here for more detail on how to prune your plants. Be certain to clean them after pruning each individual plant by wiping down the blades with isopropyl alcohol. Skipping this step risks spreading diseases between different plants—something you definitely want to avoid.

A good set of sharp pruners is a necessity in your toolbox. Sharp cuts do less damage to plant tissues.

AIR STONES

A bit more air is never a bad thing for plant roots, especially in a hydroponic environment. Depending on your type of hydroponic setup, it might even be a must! Air stones might not be necessary in most systems, but that doesn’t mean your plants won’t benefit from you adding one to the mix.

An air stone is a cylindrical or disk-shaped porous piece of ceramic, glass, plastic, sandstone, or other mineral. Their porosity allows you to force air through them to create streams of little bubbles when placed in a liquid. While I haven't come across a store-bought hydroponic system that includes one, AeroGarden does sell them on their website. There are many options available online should you want to add one to your system. The primary reason to add an air stone is to increase oxygenation by raising the amount of dissolved oxygen present in the nutrient solution. A bonus effect is that the added movement caused by the air being forced through the stone can help reduce stagnation of the nutrient solution.

This combination of increased oxygenation and nutrient solution movement helps create healthier roots. And healthy roots are better able to absorb nutrients, which in turn leads to healthier and more robust plants. The aerobic environment the air stones generate is also good for beneficial microorganisms and helps reduce root diseases.

These small stones can go a long way toward improving root and overall plant health.

MAGNIFYING GLASS

Magnifying glasses are handy tools for inspecting your plants to see the signs of pests or diseases that would otherwise be very difficult to spot.

Aphids are extremely small, so you might easily overlook them unless you're inspecting your plants regularly.

SYRINGES

This might seem like an odd accessory to suggest, but I have found syringes to be so helpful. I have quite a few of them in my grow room that I use to extract and measure different nutrients or other additives for my plants. The idea was suggested to me by my sister when I was complaining to her about the messes I made pouring nutrients into caps to measure them. Syringes are often available online in bulk packs, and I like to buy larger 60ml ones and smaller 10ml ones, as these sizes best fit the nutrient bottles I use. I often also use the bigger syringes to water seedlings for my outdoor gardens when they are just getting started. It might seem like a strange accessory at first, but they've become a staple on my own list.

Using this type of graduated syringe saves me from needing a separate set of measuring spoons, avoids the mess of measuring into the cap, and just keeps everything more precise.

OSCILLATING FAN

Everyone growing hydroponically should have an oscillating fan. It is key to simulating the breezes that plants would experience outside. It helps with air circulation, tip burn for plants like lettuce, and helps build stronger stems in developing seedlings. Just remember you want your fan to create a gentle breeze rather than hurricane-force winds—less is more in this case. The oscillation is an important element, as you don't want the air current blasting continuously in the same place. The movement of the oscillating fan helps introduce air movement while also giving the plants recovery time.

Of all the accessories available, a small oscillating fan is one of the most important. It helps build strong stems, increase airflow, and keep pests and diseases at bay.

SPRAY BOTTLE

It is always handy to have a spray bottle (or two or three) around when you are growing food hydroponically. They're useful for giving your plants a misting to increase the humidity, for applying foliar spray to give them a boost (see the sidebar below), and in the worst case (and hopefully rarely) to apply pest or disease control solutions. I like to label my bottles and only use them with the same solutions to keep things organized.

It is always good to have a spray bottle or two around in case you need to quickly spray your plants or treat pests or diseases.

WHAT IS A FOLIAR SPRAY?

At its core, a foliar spray refers to any solution that is sprayed onto the leaves of your plants. When it comes to hydroponics, I separate foliar spray into two categories. One type is for enhancing plant growth and the other type is for dealing with pests or diseases.

The enhancing category includes sprays like diluted nutrient solution (weaker than what you're using in the grow bowl) or PureCrop1. This type of spray can help give your plants a boost. It is best to focus this type of spray on the underside of the leaves where the stomata are more concentrated and it can be absorbed easier. This type of spray is seeking to feed the plants through the leaves.

The "dealing with pests or diseases" category includes sprays like neem oil, PureCrop1, insecticidal soap, or similar products. Again, these are best focused on the underside of the leaves, especially in the case of pests, as they tend to congregate there. This type of spray is seeking to coat the leaves to repel or suffocate the pests or diseases.

No matter what type of spraying you're doing, you want to make sure that you are spraying during your light's off cycle to avoid burning the leaves.

CHAPTER 5 - CHOOSING AND SETTING UP YOUR SYSTEM

This chapter explains the things you'll want to consider when deciding whether building or buying a hydroponic system is the best option for you. Remember that only you can determine exactly what you need and can weigh the importance of the many factors to consider. Then, we'll go through the steps of setting up a storebought system.

Choosing the System That Is Right for You

It doesn't matter what system Bob the guy online, your bestie, or your mother-in-law has. You need to make sure you pick the right system for YOU. That may mean it is smaller or bigger, simpler or more complex, or cheaper or more expensive than what somebody else has. Don't let others dictate the system you get, especially if it is more expensive. You don't want to end up with a system you don't like or use. You should listen to what different people say, and compare reviews, but take these with a grain of salt. Everyone is going to have different factors to consider such as budget, space, and gardening goals, to name just a few. To make the right decision, we need to get a few nuggets of knowledge under our belts and rely on these guiding principles as we grow with our indoor gardens.

The major brands are approachable means for accessing the in-home abundance of hydroponic gardening, but they're not the only option.

I love being able to grow food indoors—it honestly makes me proud and brings me so much joy. Of course I made a sticker to celebrate!

START SMALL AND KEEP IT SIMPLE

When you are starting anything new, it can be hugely beneficial to start out small and grow (no pun intended). Even if your heart is set on one of the big fancy systems or some massive DIY build, it may still be a good idea to start with a small store-bought system or a simple and small DIY build if you are trying this for the first time. The last thing you want is to fall into analysis paralysis, and I say this as someone who has been there many, many times. It is better to start somewhere than to get stuck in the loop of worrying so much about making all the right decisions that you make no decision at all. If you are really unsure, choose a cheaper option instead of choosing no option. For store-bought systems, the AeroGarden Sprout or Click & Grow 3 can get you started without much initial investment. If you are thinking you may want to build, then a Kratky jar or simple deep water culture system is a great place to start. The most important thing is you do actually start!

START WITH RESILIENT AND FAST-GROWING CROPS

If you are just dipping your feet into the wonderful world of hydroponics, starting out with fast-growing and resilient plants is key. It allows you to see the results in a short period of time and to build your confidence! Choose resilient crops to allow some buffer room against your lack of experience. Some great plants to start with are leafy greens, such as herbs and lettuce. Another bonus to growing lettuce and herbs is they both do amazingly well hydroponically. I have grown some of the biggest basil leaves ever in my indoor gardens. Plus, if you're looking to reduce your grocery bill, you can grow herbs that are stupidly expensive at the grocery store for a fraction of the cost. They can also give you an almost continuous harvest rather than desiccating in the back of the fridge in their plastic containers—I'm looking at you, herbs!

STICK TO YOUR BUDGET

Cost can be a big factor, so before we delve too deep, let me be clear. You can grow at home for cheap because you can always start with a Kratky jar or a secondhand system. Do not feel like you need the most expensive

system to be able to grow food. You don't. Stay within your budget. There is no point blowing your budget and then regretting the decision and then not growing any food! If you go with one of the more established companies, then the cost is typically higher, but they also tend to come with a higher level of quality and support. If you're building your own system, the different types all have different average price points. The overall cost will depend on which grow bowls, substrates, pumps, etc., you are using. Generally, Wicking and Deep Water Culture systems can be less expensive to begin with. You can start those systems for under $150 in most locations. Ebb and Flow, Nutrient Film Technology, Drip, and Aeroponic systems are all more expensive, ranging from $150 up through thousands of dollars.

There are a lot of "off-brand" products available as well. Just be sure to read reviews if you are going to buy one of these online. There is such a wide range in cost, from under $100 to well over $1,000 and all sorts of price points in between. If you are buying a secondhand system in person, you can always ask to see that the pump and lights function ok. Even if the pump doesn't work, that can be an easier thing to replace than the lights. If it is a higher-level model and it comes with a screen, then it is always good to check that too. A secondhand machine can be a great way to get started, especially if you are not 100% sure you want to commit to buying a bigger or more expensive version. Use it as a way to dip you toes into the world of indoor gardening for a reduced cost. Then, when you quickly become obsessed, you can get other systems!

HOW MUCH WILL MY SYSTEM WEIGH?

This is a great question to ask! These units can get quite heavy when they are filled up and running. The weight of any given system includes the weight of the unit itself, but you also need to factor in the weight of the water. A gallon of water weighs approximately 8.3 lbs. (3.8kg). Don't forget water held in individual trays (if applicable). My two-tier Rise Garden (the original model) holds about 5 gallons in the main tank, plus 1 gallon in each tray!

CONSIDER THE SPACE YOU HAVE (OR DON'T HAVE)

Space considerations include both how much space you have and where exactly your hydroponic system is located. First, let's identify how much space you have available for a system. Do you live in a house that has lots of wall and/or counter space available? Or are you in an apartment with barely an inch to spare? If you are in a small apartment, large systems, such as the tiered Rise Garden, Click & Grow Wall Farm, and Tower Garden, may be out of consideration right from the start. Narrow down the list to systems that fit in your space.

Remember that these systems are also full of water, and they are bright when lit. You'll need to consider not only the physical space but also how it will impact your life. What if it leaks? Will it ruin the new floors you installed? One quick solution is setting up your system in a boot tray or similar product. These trays won't prevent damage from large-scale leaks, but they are a solid safety net for smaller leaks or spills. If you love watching movies cozied up on the couch at night, then maybe you don't want it in your living room. Remember, the lights are typically on for 16 hours a day!

Do you have pets, especially cats? Not only are cats known for knocking things off any given surface, but they also love to eat green things! This can be not only annoying but also dangerous as certain things you may grow (for example, chamomile, lavender, and green onions) can actually be toxic to them! You may want to consider a place where they won't be able to get to your unit, or you may have to be more careful about what you grow.

Does the saying "out of sight, out of mind" resonate with you? While these units take care of a lot of the growing for you, you still need to make sure they have sufficient water and nutrients. I am definitely a person who needs things in front of me or I tend to forget them!

I solved my space needs by turning my office into a grow room. I can close the door to keep the cats out, and I can have the lights on through the night if I want. I'm in there just about every day, so it is easy to monitor

water levels and plant health. It’s not far for me to run upstairs while I am cooking to snag thyme, cilantro, or a jalapeño for our fancy taco night!

Rise Gardens also has a smaller personal unit that takes up a lot less space than their tiered models.

If space is an issue, then an AeroGarden Sprout is a great option as you can stick them just about anywhere.

WHAT FITS WHERE?

The AeroGarden countertop models (Sprout, Harvest, and Bounty) are best suited for use in your kitchen.

Click & Grow Smart Gardens 3 and 9 are also good options for the kitchen.

Tiered Rise Garden models are best if you have wall space, and they allow you the most flexibility to expand. Personal Rise Gardens can also fit on the kitchen counter, but they have bigger footprints, so you need enough space to accommodate that.

If you'd want to create a system that hangs in your window to take advantage of natural light, you'd need to DIY your own model.

I love the combination of the white and the light wood that is the hallmark of Rise Gardens.

CHOOSE YOUR AESTHETIC

If your hydroponic system will be somewhere highly visible, you may want to give a thought to the system's aesthetic. It will also depend on whether you lean more toward form or function. If you couldn't care less what it looks like as long as it works, then this may not even be a consideration for you. If, however, you value both, the look and feel of the units may weigh more heavily into your decision. While I am all about function, I still want

my systems to look nice, especially if I have them in other areas of my house.

DO YOU WANT ROOM TO EXPAND?

If you feel confident that you'll want to expand your system, you'll need to make sure you have enough space. Rise Gardens is the only store-bought option that has modularity built into their systems. You can start with the base unit, which allows you to grow (using the standard grow decks) 12 plants. Then, you can add on a second or even third tier! You could also buy additional units of Click & Grow or whatever system you are using. I personally like that you can grow upward rather than having to find another section of counter. Click & Grow does have a nice stand that comes with the Smart Garden 27 that you can also buy separately to grow upward.

WHAT ARE YOUR GROWING GOALS?

Taking a moment to consider what your own growing goals are should weigh more heavily into your decision of what system to buy. As I mentioned, these things are not cheap, so buying what meets your needs rather than overbuying can be a real consideration. If you have no goals of growing a significant portion of your own food and just want to focus on a few herbs, then a small system like an AeroGarden Sprout or Click & Grow 3 could be absolutely perfect. Conversely, if you want to seriously cut down on your grocery bill, then one of the bigger systems like a Rise Gardens may make more sense. The systems sometimes offer seed kits for growing ingredients that are commonly used or grouped together, for example, the ingredients for salsa, steak seasoning spices, or superfoods. Each offers grow-anything pods, however, so you can more truly customize what you grow without these kits and using the system you prefer. It is always a good idea to take some time to jot down your growing goals in your data notebook.

DON'T BE TOO SCARED TO START!

Starting anything new can make it overwhelming and sometimes seem like too much. If you are feeling this way, then please know that I am the queen of overthinking and analysis paralysis. I get you! But more often than not, giving into that feeling has held me back from trying things. Whether you think you have a black thumb or if you have tried before and killed a few (or a lot) of plants, know that growing in these hydroponic systems is pretty forgiving. That's not to say it's foolproof, but it's a great place to start!

It's definitely true that if you never try, you'll never have the opportunity to succeed. It is also good to shift your view on failures. This is something I have found very helpful! While you could view a setback as "proof " that you have a black thumb or can't grow things, you could view it as a way to learn. Most failures come from a knowledge gap, and the great thing about those is they can be fixed! Know that some plants will die, and others will thrive, and it's ok—I promise! I STILL have failures and kill some plants. This is where keeping track of your data can be really helpful! If you track what you did, you can see where you may want to make changes in the future. The most important thing is to get that seed in the pod and give it a chance to grow. You can grow along with it!

Should I Build or Should I Buy?

Now that we have covered the considerations for choosing a system, let's look at the pros and cons of building and buying. If you are more of a visual learner or if you just love a choose-your-own-adventure (I loved those books when I was a kid!), I have also included a flow diagram to help guide your decision.

Should you BUILD or BUY?

How comfortable are you with DIY projects and using tools?
DIY is my middle name.
Tools?
What's your budget like?
What's your budget like?
I'm on a tight budget
I've got money for a DIY any day of the week
I'm on a tight budget
I'm okay spending more for convenience and aesthetics
Kratky system
DWC system
Wicking system
How much space do you have available?
Small store bought system (AG Sprout or CG3)
Kratky Mason Jar
How much space do you have available?
I have loads of space
Not much...
I'll make room...
I have a some counter space
Aeroponic system
NFT
Drip system
Do you want to be able to expand later?
What do you want to grow?
Medium store bought system (AG Bounty or CG9 or Personal Rise Garden)
Yes for sure!
Nope
Anything and everything!!!
Greens...
NFT
Drip system
Ebb & Flow
Aeroponic system
Do you want it to be pretty?
CG25
I don't care
Um...yeah!
Large store bought system (AG Farm)
Large store bought system (Tiered Rise Garden)

Use this decision tree as a guide when considering whether to build or buy your system.

Use this decision tree as a guide when considering whether to build or buy your system.

BUYING A HYDROPONIC SYSTEM

Let's look at some of the reasons you may want to buy a system and a few of the reasons you may not want to. Just make sure you are making the right choice for you. You don't want to spend the money to buy a system just because someone told you it is the best option, and you know in your heart of hearts you want to build one. Whichever option you choose, just make sure it is your choice.

PROS OF BUYING

- **Pretty much everything you need comes in the box**, and you can have it up and running in less than an hour. You get the unit, the lights, and your first round of plants to grow. It is the quickest way to get gardening and start growing your own food at home!
- **It's great for beginners who are overwhelmed** with starting to grow food (indoors or out). If you don't know where to begin, then using a system that is going to walk you through the entire process is a great place to start. Plus, they are great to build upon when you get more skills under your belt. You can have different systems running at different pH levels, so it is not really something that you quickly outgrow.
- **It's great for people who believe they have a black thumb** (rest assured, you don't—nobody does). Perceived black thumbs are usually from a lack of gardening knowledge, overloving/watering your plants, poor soil, having the wrong plants for where you live . . . the list goes on. By using a hydroponic system, you can take so many variables out of the equation, and this greatly increases your chances of a successful harvest.
- **There are many options** because there are so many systems to choose from! Smaller systems may grow three pods, some larger systems can grow over 100 plants, and there are many systems in

between! Some are space saving, some are gorgeous to look at, and some can grow with you as you want to grow more.

CONS OF BUYING

- **It can be expensive**. You are paying for someone to have done all the planning, designing, and construction for you. Prices can range from just under $100 to well over $1,000 (or more), and this can put buying a system, or buying the system you want, out of some people's reach.
- **You need to buy replacements from the manufacturer** in the event that something breaks down, such as a light or pump. Or you may be able to find an off-brand replacement that will hopefully work. Depending on the system, you may not even be able to replace the part and may have to buy a new system!
- **It can be overwhelming deciding which brand and model is best for you.** Do you start small or go big or go home? Which brand is the best one to get? Do you get a plain colored one or a pretty blue one? Do you want the more expensive one with the digital display and WiFi or do you keep it simple with the basic one? All these decisions can quickly overwhelm someone who isn't sure what they actually need.

BUILDING A HYDROPONIC SYSTEM

For some people, the idea of a doing it themselves is reason enough. For others, it might be about building the *perfect* system for them. Whatever the reason, a custom-built hydroponic system will always be the most suited to your situation. I have seen some really cool ones built right into a grow tent, and I'd love to try that out for myself.

BUILDING MATERIALS TO CONSIDER FOR DIY SYSTEMS

Systems can be built at home using PVC pipes, grow lights, a bucket to serve as a reservoir, and a pump to circulate the water. This allows you to build a custom system to fit the size and dimensions perfect for your space.

Outside of a Kratky jar system, I have not built any at-home systems, but if you are thinking about building your own hydroponic system, the following is a list of some of the things you should consider starting with to construct your own custom indoor garden.

- PVC piping
- Air pump
- Black vinyl tubing—this is important, as clear tubing can lead to algae buildup
- Fittings—you'll need flood and drain fittings, grommets, and tubing connectors
- Net pots for holding your plants

- Plastic buckets, pots, or tubs to serve as reservoirs (or for larger Kratky systems).
- Growing mediums (any of those listed on pages 35–37 will work)
- Grow tent (only necessary if you want to enclose your DIY setup to make the most of the grow light)
- Grow light—LEDs will last the longest and will give off much less heat than older fluorescent models
- Wood for boxes or frames
- String or felt (only if you're constructing a wicking system)
- Zip ties
- Spray or drip nozzles
- Screws
- You might also need some standard DIY tools, including a drill, drill bits (including a larger size for making the net pot holes), screws, a measuring tape, work gloves, safety glasses, a level, saws, a permanent marker, a staple gun, etc.

There are a few other things you should consider, as well:

- Simpler systems, like drip or Kratky, will cost less to build and maintain.
- More complicated systems, like aeroponic or NFT systems, will be more expensive to build and will require a lot more DIY know-how.
- Finally, don't try to "boil the ocean." If you are building your first DIY system, start with smaller, simpler options first before you build up to larger, more complicated systems. Don't overwhelm yourself or move so quickly that you want to give up.

PROS OF BUILDING

- **You can make it as simple or as complex as you want it to be.** You could build it to fit into an entire room, a closet, that nook under the stairs, or that awkward corner by the window. You could build it to fit on a counter or bookshelf or anything in between. You can also build any type of system (deep water culture, drip, nutrient film technology, aeroponics, wicking, or ebb & flow). The possibilities are endless.
- **You get to design a system that is perfect for you.** This means you don't have a cookie-cutter system that is trying to meet the needs of everyone.
- **It's easier to fix.** If something does go wrong with a DIY system, you know the complete ins and outs of the system and what all of the parts are made of!
- **There are so many ideas.** A quick internet search for "DIY hydroponic system" will give you great ideas to build from totes, PVC tubes, or other materials.

CONS OF BUILDING

- **There are often unexpected challenges when you are building.** DIYs can be great when you are planning and frustrating when you are actually doing them. They may not go to plan, which could lead to overwhelm and shelving the whole project. You can also end up buying additional materials or not needing something you purchased.
- **They can be expensive**, depending on how elaborate of a system you have designed for yourself.
- **There are (most likely) no instructions to follow.** This can be freeing, but it can also mean problems if there was a flaw in your

plans. It can be worse if you don't discover this flaw until you add water to the system, and it ends up all over the floor.

- **It's not usually right for beginners.** If you are just getting started growing food hydroponically or if this is your first attempt at growing food EVER, then adding the complexity of building your own system could be way too much. If this is new to you, you may not know exactly what you're looking for in a system.

If you are still on the fence and thinking *maybe* you want to dip your toes into hydroponics without buying an expensive system or building some intricate DIY, Chapter 6 is for you. We will look at one of the simplest DIY hydroponic systems you can "build." I put the word "build" in quotes because it is pretty much just assembling pieces with no tools needed! Turn to here to jump into the wonderful world of Kratky (mason) jars!

Setting Up a Store-Bought System

The moment is here: We need to get that machine out of the box and start growing some food! If this is your first time growing, then I am so excited for you. The feeling you get after putting a seed in soil or a grow pod and seeing it come to life, knowing you can use it to feed your family, is such an incredible feeling. To be honest I STILL get excited when I see my seedlings sprout, and I have sprouted many thousands at this point in my indoor and outdoor growing journeys. Let's jump into setting up your system so that you can experience the excitement as well.

Once you've chosen the system that's right for you, it's time to set it up and get growing!

UNBOXING

The two most exciting times for me are always unboxing a new system with all the possibilities it holds and starting a brand new batch of seeds. We just covered all the parts of a hydroponic system in Chapter 3 (see here), and now as you unbox your system, you can familiarize yourself with each of them. It is always good practice to take everything out of the box, lay it out, and make sure all the pieces are there. Some systems just need the light to be attached while others require a full build.

There is something exciting about the growing potential of a new system still in its box.

PUTTING IT ALL TOGETHER

By this point, you should know where your system will live. All you need to do is assemble it. Make sure you do not plug in your unit until it is all set up and you have water in the grow bowl. If you plug it in before that, you could damage your pump. Take all the pieces out of the box and lay them out in front of you. (You can refer back to Chapter 3 on here on the parts of a hydroponic system if you need refresher.) It is also a good idea to read through the instruction manual that comes with your system. Make sure you have all the parts you are supposed to have as well as any tools you may need to assemble your system. I know it can be hard because there is a lot of excitement with a new system, but winging it is not a great idea and can lead to issues later, especially if you have to build the system (as with expanded Rise Garden systems for example). Once you have assembled your system, be sure to put the instructional manual somewhere safe. It can be a lifesaver later when you have to do a deep cleaning and need to disassemble and reassemble the whole system! Now, let’s take a look at the different kinds of water you should and shouldn’t use when you fill your grow bowl before you plug in your new system.

Make sure you don’t have your system hidden away. You don’t want to neglect it, and I truly hope seeing your system makes you as happy as I am when I see mine.

ADDING WATER TO YOUR SYSTEM

Water may be something you don’t really consider, but it can have a big impact on your success, and some types could even wreck your system! I also apply my good, better, best mentality when it comes to water. Pure water is pH neutral, but different treatments that may have been applied or conditions where the water exists can impact the pH. You could be doing everything else perfect and have the water you use be your downfall! Let’s take a quick tour of all the water types you have available and why you may want to use one over the other. After that, you can fill up your system with confidence!

I am always amazed by the variety of things that you can grow indoors hydroponically. I'm loving this little mini pumpkin that I have growing in my Rise Garden.

- **Tap water** comes in many shapes and forms. It can be hard (higher calcium and magnesium content) or soft (higher salt content). There can also be a lot of things added to public utility tap water in an effort to make it safe for us. Things like chlorine, fluoride, and other chemicals can also change the water's pH. Even if you are not planning to use tap water in your systems, you may want to invest in a water test just to see what you are dealing with. You can remove the chlorine in tap water by leaving it to sit for 24 hours,

which gives the chlorine time to evaporate. As a side note, if you have a fish tank and fill it with tap water, you should always go through this process as well.

- **Well water** is one type that I would not recommend. It often has dissolved minerals in it, such as calcium, which can alter the pH and affect the health of your pump and overall system. Limestone underground can affect the pH of well water, and all sorts of things can leach into the underground water system. If you have no other choice than using well water, it is imperative that you test the pH before adding any nutrients and invest in some form of filter. Working with well water will make your growing experience more complicated.
- **Rainwater** is a free and great option. If you have a rain barrel set up (and you totally should, unless it is not legal where you live), you can collect rainwater and use it in your systems. Plants thrive on rainwater, and it's the only thing I use in my outdoor garden. You will want to test and filter the water because it does contain higher amounts of dissolved nitrogen. Also, consider the surfaces it may interact with. How clean is your roof? Your gutters? Your downspouts? The water could pick up any number of nasties as it passes into your rain barrel. This means filtering is important for rainwater.
- **Distilled water** is created by boiling water so that it turns into steam, letting the steam condense and form water droplets, and then collecting the purified water. This process removes any impurities, chemicals, bacteria, and any other nasties that may have been in the original water. It brings the water back to being a neutral pH and is a fabulous option for any hydroponic system.
- **Mineral water and spring water** are ones you should skip. They tend to be heavy in minerals (as the name "mineral water" implies) and can lead to trouble ahead. If you are buying distilled water

from the store, make sure that you are not grabbing one of these bottles instead!

- **Filtered water** is the next best option to distilled water. If you are going to use any water other than distilled, you can always make it better by filtering it. You can use the water from any filtered water pitcher or system (just let it come to room temperature first), or if you want to get fancier, you can use a reverse osmosis system.

Taking the time to set up a fan, set the lights at the right height, and level your unit will give your seedlings the best environment in which to thrive.

BEFORE THE SEEDS GO IN

There are a few last-minute considerations before those all-important seeds go into your unit. First, make sure you have a small oscillating fan set up near your unit. Make sure it is set on low and set to rotate. This will help your plants grow strong stems and aid in air circulation, which can help deter pests and diseases.

Next, make sure your light height is set at the lowest level, so the seeds and new plants have access to the light strength they need. If the lights are

too high, it will force the plants to stretch for it. This will result in “leggy” stems that are weaker.

My last tip is to make sure your system is level (or, for NFT systems, that the channels are angled between 1 and 3 percent). Any time you are dealing with water inside, having the container level is a good idea. If you are using a system that relies on a drip method, then it becomes even more important. If the system is not level, then some pods could receive more water, and others will receive less or none. You can use a normal level, or if you have an iPhone, you can use an app called Measure, which has a digital level feature.

CHAPTER 6 - KRATKY HYDROPONICS

In this chapter, we'll look at how the Kratky system works and what parts you need, and I'll walk you through how to set up your very own system. Besides being a great way to get started in hydroponic gardening, the Kratky method can be useful if you want to transplant your plants when you are resetting or cleaning your other systems.

Kratky hydroponics is a noncirculating and passive method of growing food without any reliance on soil or electricity. It is the simplest form of deep water culture hydroponics. This system is relatively cheap because there are no pumps, power, or complex infrastructure required. It relies on a noncirculating nutrient reservoir with a water-air interface. This means that, in a Kratky system, the plant roots are partially submerged in the nutrient solution and partially exposed to the air, which aids in facilitating the nutrient uptake and reducing root rot. As plants grow and absorb water, the level of the nutrient solution drops. The plant develops "air roots" that grow in the air space created within the container as the nutrient solution drops. Ideally, by the time the plants are ready to harvest, almost all the nutrient solution has been used up.

The Kratky hydroponic method was initially created in the early 2000s by Dr. Bernard Kratky, a researcher out of the University of Hawaii, who worked in the Department of Tropical Plant and Soil Sciences. He was looking for a method to help resource-limited farmers in Hawaii deal with water scarcity issues. His focus was developing a method of farming that

was simple and straightforward, cost and space effective, and not reliant on electricity or any complicated equipment. It was initially meant for lettuce cultivation, but it has since been adapted for other types of crops.

GROW
WITH THE
FLOW

The Kratky hydroponic system is the simplest form of a deep water culture system, and it can be a great way to get started in hydroponic gardening.

Anatomy of a Kratky System

If this is your first time hearing about Kratky hydroponics, you may be wondering what exactly this low-tech method of hydroponic growing looks like. The diagram below shows what an at-home Kratky system contains. Let’s look at each of the parts.

Kratky mason jars are a cheap and easy way to grow a few plants indoors or make a new place for an AeroGarden plant that is too big or just needs to move out so you can replant the whole system.

BASKET

As with any hydroponic system, we need a basket to contain the growing medium and the plant and to help keep it suspended above the nutrient solution. Typically, net pots (plastic, webbed containers) are used to allow the nutrient solution to be in contact with the growing medium at the start of the growing cycle. As the plant grows, the roots are able to grow through the webbing to reach into the nutrient solution as it slowly lowers in the reservoir.

COVER OR FLOAT

The cover in a Kratky system serves three purposes. First, it provides a support for our baskets. Second, it helps keep light out so that we keep the dreaded algae (hopefully) at bay. Third, it helps prevent the evaporation of the nutrient solution. In some larger systems, people will use Styrofoam so that it floats right on top of the nutrient solution. The cover should be opaque and food safe, so if you are using plastic, make sure it is BPA free.

As with most hydroponic systems, we need to make sure the top is covered to reduce the amount of light that has access to the nutrient solution.

The baskets are going to hold the growing medium and act as a base for the growing plant.

GROWING MEDIUM

A growing medium is needed in order to anchor the roots and to help support the plant. There are many options you can choose, but we are aiming for something that is inert and pH neutral. The options listed on pages 35–37 will all work in Kratky systems, including pods made for brand-name systems. There are even many third-party makers of Kratky lids specifically meant to work with AeroGarden pods. Just see here if you're thinking about starting seeds in a Kratky system.

RESERVOIR

The reservoir is the container for the nutrient solution to reside in. Since we are using a Kratky system to grow food, we want to ensure that whatever container we use is food safe. The container needs to be opaque because we do not want to create any opening for algae to rear its ugly head. Clear containers are out unless you provide an opaque sleeve to cover the container. The size of the container also needs to be considered because it needs to hold enough nutrient solution to support the plant through its life cycle.

There are many different growing mediums you can use in a Kratky setup. It is good to try them all out and see which one works best for you.

A mason jar is a great Kratky reservoir, and they come in many different sizes. This allows you to choose the right one for the plant you want to grow.

NUTRIENT SOLUTION

This is where the magic happens! The nutrient solution will provide your plant baby with all the essential elements it needs to grow. That’s why it is very important to calculate your solution properly. If you are new to the Kratky system, using a premade hydroponic nutrient mix is probably your best bet. As you gain more experience, you can start making your own, but

there are a lot more factors that will need to be taken into account. Otherwise, you risk your plant not receiving the nutrients it needs or receiving too much and damaging it.

You'll also want to make sure that the water you use as the base for your nutrient solution is clean and pH balanced. Review the considerations for water on here.

PLANTS

The Kratky system is best suited to growing leafy greens and herbs. That doesn't mean you *can't* grow other things using this method, but it will add to the complexity. Leafy greens and herbs are quick growing, and they don't require as much as plants that produce fruit. Lettuce is by far the easiest plant to grow in a Kratky system, and basil comes in a close second. Try things out and see what works best for you.

OTHER HELPFUL TOOLS

As with all hydroponic systems, you can keep everything basic or add to the setup. I recommend using a fan whenever you're growing, regardless of the method, and any of the tools listed in Chapter 4 will be helpful but are not mandatory. However, they will help shift the situation from plants that are just surviving to plants that are thriving!

HOW MUCH NUTRIENT SOLUTION/WATER DO YOU NEED?

I mix the nutrient solution with water as recommended by the manufacturer, then I fill up my jars.

I usually use 32 oz. (946mL) amber mason jars. With these smaller jars, you will need to keep an eye on the water level. It may need to be refilled depending on the plant you are growing.

You can also use larger 64 oz. (1893mL) jars, which are less likely to need to be refilled. Note: These can be harder to find, more expensive to buy, and will make a larger mess if they tip over.

Something like lettuce, for example, typically needs about 1–2 inches (2.5–5.1cm) of water per week. In a Kratky setup, it would likely need 1 gallon (3.8L) to get it to maturity.

Advantages and Disadvantages of the Kratky System

Now that we are aware of what a Kratky system is and how it works, we need to look at the pros and cons. This is, by no means, an exhaustive list, but it covers some of the top considerations.

PROS

It's simple. Simplicity is one of the great things about Kratky, especially for beginners. You get a jar, a lid, a basket, some liquid and nutrients, and a plant. Simple can be great if you struggle with overwhelm or just want to try this thing called hydroponics without dropping a lot of money. The benefit of a Kratky system is that you don't have to fuss about with nutrient solution once everything is set up. You just fill the reservoir with enough water and nutrients at the beginning to feed the plant throughout its lifespan.

It's affordable. Affordability is another big plus, which ties back to why it was created. Hydroponic systems can very quickly get expensive. While I 100% believe they are worth it and they do end up saving you money, it can be hard to rationalize that at the beginning when you are shelling out the bucks! Kratky is rooted in requiring very little to build a system and to be up and running and actively growing food without breaking the bank.

It's easy to maintain. No moving parts and not many parts in general help make this an easy system to care for. It definitely has a set-it-and-forget-it feel. While it is not 100% hands off, it is way less work than many other hydroponic systems. You just need to keep an eye on the

nutrient solution level in the reservoir to make sure there is enough left. If the plant will be in the system for an extended period of time, you may also want to do some pH testing to make sure things are not getting out of balance.

CONS

It has fewer options for what you can grow. With Kratky systems, especially mason jar Kratky systems, you are more limited in what varieties you can grow. While nothing is impossible, especially if you are determined, things can quickly become impractical. As I mentioned earlier, Kratky is well suited for leafy greens and herbs. Plants that are really thirsty can struggle, and fruiting plants are going to require changes in the nutrient solution as they grow and mature. Tomatoes and peppers are great examples of thirsty plants that also require a good deal of room for their roots, and they have a long lifespan. Root crops also don't grow well in a Kratky system.

There's a greater risk of spilling. Whether it is your cat being a jerk, a curious child, or a topheavy plant, spills can happen much easier with a Kratky jar. Also, if you are using mason jars to create your Krakty system, you could end up with broken glass in addition to spills if there is an accident.

It can take up too much space. Kratky is best suited to growing one plant in one container if you are using mason jars. This means it can take up a lot of space if you want to grow more than one type or more than one plant in a Kratky jar. Having many Kratky jars starts to take up a lot of space and can lead to increased chances of spills.

Starting Seeds in a Kratky Jar

When starting from seed, the growing medium becomes very important because you don’t want the seed to fall down too low or get lost in the nutrient solution. My recommendation is to use mineral wool or a store-bought system pod. That is not to say you couldn’t use vermiculite or coconut coir, but they are finer substrates that could potentially fall through your cups or baskets and may cause blockages in your system later on. I would not recommend perlite or leca pellets because they have lots of gaps that small seeds could fall though.

Make sure the growing medium is touching the nutrient solution. We don’t want the medium to dry out before the roots have had a chance to extend below it. You can set your Kratky jars up on a (preferably south-facing) windowsill and let them do their thing—provide you with things like lettuce and herbs all year round!

If there is enough space and the light height allows, you can pop a Kratky mason jar right on the grow deck of your system. If not, they can be set up just to the side to take advantage of

the light spill.

Transplanting Grown Plants to a Kratky Jar

Sometimes a system can get too full, and you need to transplant one of the plants. Alternatively, you may want to restart your system, but there is a plant that is still growing well, and you don’t want to just throw it out or compost it. A Kratky system can be a great way to solve these challenges.

It is important to remember that any time you take a plant out of its known environment, it could die or fail to thrive. With hydroponics, transplanting to a Kratky system has an advantage over transplanting to soil. You can keep the plant in the same basic environment (whatever room you have your store-bought system in), and you can move it into a similar nutrient solution. This can be less traumatic to the plant than switching it from growing in a nutrient solution to having to adapt to growing in soil (though this does work successfully too!). You can also set your transplanted Kratky jar close to the hydroponic system you took the plant out of to leverage the light from the system’s grow lights.

2 PACK
Ball

Amber mason jars (if you can find them) are a great choice for Kratky jars because they don't need spray paint to keep the light out of the nutrient solution.

Building Your Own Kratky Mason Jar System

While there are people who build whole Kratky setups at home, most people use Kratky jars. Let's look at how you can assemble a Kratky system at home. I like using mason jars for my own Kratky systems, but as long as the container you're are using is food safe and holds water, just about anything can act as a Kratky vessel.

SUPPLIES:

- 3" net pot (perfect for wide-mouth mason jars) or smaller basket with a cover
- Mason jar (I like the 32 oz. or 64 oz. widemouth amber mason jars)
- Mason jar metal ring
- Growing medium of your choice

- Nutrients
- Water
- Seeds or a plant
- Spray paint or cover for jar (not needed if using an amber jar)
- pH tester (optional)
- pH up and pH down (optional)

1

If needed, prep the jar to prevent light from being able to get to the nutrient solution. If you are using an amber mason jar, you can skip this step. You can use a sleeve (even a thick, black sock could work, but cut the bottom off so the jar can sit flush). I opted for black chalkboard spray paint, sprayed in a few even coats on *only the outside* of the jar.

2

Mix up your nutrient solution. I suggest keeping it simple and using AeroGarden, Fox Farm hydroponic, or another type of nutrient mix that only needs added water. Mix the nutrients in the recommended ratios so you have enough nutrient solution to fill your container. To start, we just want the bottom third of the net pot to be in the solution. I like to mix up a bit more than I will need so I can easily top off the jars if the nutrient level is dropping too quickly. Ideally, you want the nutrient solution to be used up without having to add any more during the plant's whole life, but that can take some practice. As with anything, try out different ones to see which works best for the setup you are creating. Take notes and make adjustments the next time.

3

Check the pH of your nutrient solution (optional but recommended). Check the pH so that you can get it into the ideal range for the plant you want to grow so you achieve a successful harvest. While different plants will vary on their preferred pH, a good average range is 5.5 to 6.0. I always recommend testing it out yourself to see what works in your own growing environment. If your nutrient solution is out of the target range, use pH up or pH down to adjust it. Make sure it is thoroughly mixed in before you test again. Also remember that a little goes a *long* way!

4

Place your net pot onto your jar and use the metal ring to secure it into place. If you are using one of the custom plastic covers to fit an AeroGarden pod, this would be secured beneath the metal ring, as well.

5

Fill your mason jar so that the nutrient solution reaches just to the bottom third of your net pot. I like to put the cover/basket on first to make sure I am getting the nutrient mix to the right level.

6

Presoak your growing medium (optional). It is a good idea to presoak your growing medium, especially if you are using something that sucks up a lot of liquid, such as coconut coir. This is where mixing up the extra nutrient solution comes in handy. I'm in the habit of just presoaking any growing medium I use. Presoak in a separate bowl or container so that you maintain the nutrient solution in the mason jar at the bottom third of the net cup. Presoaking will also ensure that the growing medium doesn't lower the nutrient level in the mason jar, which could cause issues.

7 **Place your growing medium into the net cup and insert your seed.** I always like to put in two seeds, just in case one doesn't germinate.

These third-party custom plastic lids are great options for Kratky. They support AeroGarden grow pods and act as covers to protect the nutrient solution from the light. Just make sure you buy the right size for the jars you are using.

8 **Cover the top of your jar.** We need to reduce the amount of light that gets into our nutrient solution to avoid any algae issues.

This can be a bit trickier when starting from seed, but you can use aluminum foil or make a reusable cover from a dark, thin plastic. If you are starting with a seedling, you can use a neoprene clone collar, which can be found online pretty easily. For AeroGarden pods, I recommend the third-party custom-made inserts for mason jars.

9

Place your Kratky jar where it will have sufficient light. You could put it on a south-facing windowsill or under a grow

light to ensure your plant baby is getting the light it needs to grow and thrive! Without it, your plants will become leggy.

10

Check on your plant babies! Make sure that net cup is in contact with the nutrient solution until the roots have grown down into the solution. Then, make sure there is enough solution left to keep the roots in contact with the solution. As the plant grows, be sure you are maintaining an air gap to keep your roots healthy (they should be nice and white/cream). We want the nutrient level to slowly drop, and the air gap to increase as the roots grow. If the roots are completely submerged, they can get root rot, and your plant will drown and die. If you notice that there is no air gap, carefully pour off some excess nutrient solution. If the nutrient level is dropping too quickly, add solution, making sure to leave the air gap to keep your plant

happy. It is also good to periodically check the pH as your plant grows. Adjust as necessary with pH up or pH down.

Neoprene clone collars should fit into or on top of your baskets or cups and wrap around the seedling. They are one option to prevent too much light from reaching the substrate or nutrient solution.

CHAPTER 7 - DECIDING WHAT TO GROW

When you are planning what to grow, start with foods that you and your family already eat.

I always find it helpful to have a plan before starting any new venture. I like to write down my why, and in this case, *why am I growing food?* Remember to figure out your why. Is it to have a closer connection to the food you eat? Is it to cut down on your grocery bill, given that it seems prices never stop rising? Is it to reduce your carbon footprint? Is it to enable yourself to eat more nutritious food? Is it because you wanted a new hobby and thought this looked fun? The reason itself is yours and yours alone, but

knowing what it is and why this is important to you is really helpful. If, at some point along your indoor growing adventure, you run into roadblocks, coming back to your why can give you the drive to carry on.

Grow What You Eat

The best things to grow are the things that your family already eats and that will cut down on your grocery bill. A great place to start is lettuce and herbs because they grow well hydroponically, they aren't too fussy, and you can get a packet of seeds for the price of one head or one bunch at the grocery store! When you buy lettuce from the store, it may feed you one salad. If you grow it hydroponically (with proper harvesting), it can give you many salads. On the other hand, you typically get more herbs from the store than you need for any given recipe. The leftovers end up in the back of the fridge and are found weeks later in an ooey gooey mess. It is so much better to only harvest what you need and let the plant keep growing, ready for your next recipe.

Multiple vs. Single Harvests

When growing hydroponically, where you often have limited growing space, it is often about maximizing what you can grow. On an AeroGarden Bounty, I have six growing spots. In reality, I shouldn't plant in more than three, maybe four of them, so how do I maximize what I can grow?

When you are planting each pod, you need to weigh what will grow in it. A tomato plant will give you *many* tomatoes (multiple harvests) over its lifetime. Something like a radish plant will give you *one* radish (single harvest). The pod is the same in both cases, but with the tomato, you can gets pounds of food vs. a few grams in the case of the radish!

It can also depend on how you harvest. A head of lettuce cut off at the base and used to make a salad will give you one harvest. However, if you only cut off the top third of the lettuce or you just harvest the outer leaves, you allow the plant to keep growing, producing, and making salads for much longer. In both cases, you may need to plant more than one to give you enough to make a salad, but you end up with many more salads in the long run.

Heirloom seeds will always have a huge place in my heart. I love the idea that I am stewarding these varieties for future generations and helping to tell their stories.

Even with something like a radish, you can grow one in a pod. If radishes are your favorite thing in the world, then you may find that worthwhile. Alternatively, you could increase the harvest by multisowing radish seeds four to six per pod! Honestly, I find they grow much better this way, and I plant them the same way in my outdoor garden.

Understanding Seed Labels and Plant Types

Deciding what you want to grow can be overwhelming, even more so when you you realize how many types of plants and seeds there are out there. Words like GMO, heirloom, hybrid, or open pollinated can be daunting to the newbie grower. But fear not, in this section we will look at them all and review a few of my favorites to get you started. Also, it is exciting to have so much variety avilable, but if it is overwhelming, remember you can start out with the preseeded pods available for the various systems.

HEIRLOOM

For seeds to be considered an heirloom variety, they need to have been passed down through the generations. Some people say they need to have existed for 50 years, others say 100 years. Many of these varieties go back much, much further than that. They have been prized for their specific characteristics, and they are generally viewed as more flavorful and nutritious. Some of the drawbacks of heirlooms is that they are less disease resistant (they can be prone to verticillium wilt and fusarium wilt, to name a few) than hybrids and can be more delicate.

I consider myself an heirloom snob, as I love to play my part as a steward of these seeds, helping to propagate them for future generations. My favorite things about them are their rich history and their stories. In my outdoor garden, I grew the Granny Cantrell German Red beefsteak tomato. It is named after Lettie Cantrell, who was given her first seeds of this variety by a soldier returning from Germany during World War II. It was her favorite tomato and became the only one she grew year over year. I just find it fascinating that the seeds we can grow today of this variety all stem back from that one seed exchange.

West Coast Seeds
ONIONS
Scallions
Kincho is a standard green onion for summer and fall production. This Japanese-type scallion has dark-green leaves and tall, straight, single-stalk stems that do not bulb. Increase the blanched stems by planting in trenches. 50 days. OP.
$3.29
0.5 gr Germ:89% Approx.235 Seeds Lot: 300254-2 Packed for 2024 341
Canada No.1 Seed
ALKINDUS PELLETED
Alkindus forms really substantial heads, up to 25cm (10") across. The tasty wrapping leaves are slightly savoyed around a flavourful, delicate head. It's very slow to bolt in summer, and features high resistance to mildew & aphids. 60 days. OP.
$5.19
OPEN POLLINATED

While all heirloom seeds are open pollinated, not all openpollinated seeds are heirlooms. You can save seeds from open-pollinated varieties, and they will grow true to form.

OPEN POLLINATED

Seeds labeled as open pollinated grow plants that are pollinated by wind, rain, and pollinators and do not require any human intervention. Some may even be self-pollinating, such as tomatoes, beans, and peppers, meaning that both the male and female parts are in a single flower. If you save seeds from open-pollinated plants, those seeds will produce plants that look, taste, and are similar to their parent plants. All heirloom seeds are open pollinated, but not all open-pollinated seeds are heirlooms (due to the age restrictions to be able to bear that name). Open-pollinated varieties are genetically diverse, and there are so many amazing ones to choose from.

HYBRID

Let me start by saying hybrids are not bad and are not GMO. All varieties, even heirlooms, if you go back far enough, came to be because of some form of hybridization. Hybrids, stabilized over time, can become open pollinated and, given enough time, can become heirlooms. Hybrids can offer benefits that heirlooms and open-pollinated seeds can't always provide. They are typically created for very specific features—they may be very disease resistant, be perfectly shaped, have the ability to travel well (think grocery store varieties), or be incredibly sweet, such as my husband's favorite sungold tomatoes. One potential negative of hybrid seeds is they do not lend themselves to seed saving, so if you like a hybrid variety and run out of seeds, you will have to buy more. We will talk more about why this is and how to seed save later in Chapter 12, beginning on here.

DWARF AND MICRO DWARF

My indoor growing world opened up when I discovered dwarf varieties. In my seed collection, I currently have 20 varieties of micro dwarf tomatoes. If you are an AeroGarden grower and have been thinking their yellow vs. red heirloom tomatoes are your only option, that may come as a bit of a shock! The AeroGarden heirloom tomatoes can become unruly and get quite big. When you start looking into

how tiny the dwarf varieties can be, you can find ones that top out at 6" (15 cm) and can easily be grown in an AeroGarden Sprout. Dwarf varieties don't stop at tomatoes. I have dwarf peas, kale, cabbages, and more. It is just another way to expand what you can grow indoors, which is always a good thing!

A quick internet search should reveal more than a few companies that offer dwarf plant seeds. You can also search for container varieties. Just make sure to check the fully grown size!

Where to Buy Seeds

There are so many places to get seeds from, and all of them are great! A big part of it is choosing your favorite store. When you're growing seeds outdoors, it is always best to buy seeds that were grown as close to you as possible because those seeds are typically going to be better adapted to your weather and pest pressures. This same logic is not as important when growing indoors because the conditions are controlled. That said, don't stress over it. The most important thing is to find varieties that get you excited to grow them.

Seed buying is in itself a hobby. If you are just getting started, it's a good idea to start small. There are always more seeds to buy in the future. Remember, even seeds from the dollar store will grow just fine, so work with what you have access to and what you can afford.

These are the tomatoes that truly won me over to hybrids. I love how sweet they are but hate that I can't save their seeds.

WHAT IS AN F1 HYBRID?

An F1 hybrid is the first generation of offspring that comes from two different parents. The parents have been selected for specific characteristics that breeders want to impart to the offspring. One tomato parent could be incredibly sweet and the other might be a beautiful shade of orange and

have a pointy tip. By crossing the parents, you could end up with an incredible sweet, pointytipped orange tomato. But if you grow the seeds from the offspring you will **not** get another incredibly sweet, pointy-tipped orange tomato. The second generation would revert to the characteristics of **one** of the parents, so you would either get the incredibly sweet tomato or the pointy-tipped orange one.

The offspring of such crosses are not genetically stable, and it takes many generations of cross-breeding before they are stable. Once this is accomplished, the new variety is no longer considered a hybrid and is instead open pollinated. This means that if you plant the seeds of the new variety you will get an incredibly sweet, pointytipped orange tomato.

Types of Plants to Grow

While I highly recommend starting with the foods you already eat, I also hope that this information will inspire you to grow outside of your comfort zone and try something new. Your favorite new thing to grow might be something you pick from the plants on this long, but not exhaustive, list. It might even be a plant you didn't think you could grow hydroponically! The plants on this list are all things I have grown myself using my Rise Gardens, Click & Grows, and AeroGardens. I have primarily kept it to fruits, vegetables, and herbs. They are listed alphabetically so everything is easy to find.

Use the information as a guide to get you started but take your own notes. I have. Note: The germination and maturity estimates are average ranges for each plant type. Some varieties, even within the same type, may be quicker or may take longer. Seeds are on their own schedules and the freshness of the seeds, the growing conditions, and a variety of other factors will influence how long they take to grow and mature. Test your water, track your seed-to-harvest dates, and start to build a roadmap for how these plants grow best for you. Over time, you will create your own plant catalogue, which can be invaluable to growing successfully. Plants with larger pH and EC ranges will be more resilient and stand up better if you are not ready to test your water to keep it in range.

If you want to grow peas, it is best to opt for a dwarf variety or else they can take over your system.

Some pepper varieties, such as purple chili or purple cayenne, have beautiful white flowers with purple edges.

Growing pumpkins indoors is not something I would recommend. While the pumpkins were tiny and adorable, the vines and leaves were huge and took away from the other plants.

These are a few of my favorite seeds companies but try as many as you can. Find your own faves, and support and buy local ones when you can.

PLANT GROWTH DETAILS

PLANT	DAYS TO...	TARGET pH	TARGET EC	LIGHT REQUIREMENTS	TEMPERATURE	COMMON PESTS	COMMON DISEASES	NOTES
Arugula	Germination: 5–7, Maturity: 30–40	6.0–7.0	0.8–1.4	12–16 hours	50–72°F (10–22°C)	Aphids	Downy Mildew, Fusarium Wiilt	
Basil	Germination: 5–10, Maturity: 45–60	5.5–6.5	1.0–1.6	14–16 hours	65–86°F (18–30°C)	Aphids, Spider Mites, Thrips	Downy Mildew, Fusarium Wilt	
Beetroot	Germination: 5–10, Maturity: 40–70	6.0–7.0	1.8–2.2	10–12 hours	61–72°F (16–22°C)	Aphids	Damping-off	
Bok Choy	Germination: 5–10, Maturity: 45–60	6.0–6.5	1.5–2.5	12–16 hours	50–64°F (10–18°C)	Aphids	Downy Mildew, Black Rot	
Bush Beans	Germination: 7–14, Maturity: 50–60	6.0–6.5	2.0–4.0	12–14 hours	65–75°F (18–24°C)	Aphids, Spider Mites, Thrips	Root Rot, Powdery Mildew	
Cabbage	Germination: 5–10, Maturity: 45–60	6.0–7.0	2.5–3.0	14–16 hours	50–75°F (10–24°C)	Aphids	Black Rot, Downy Mildew	
Calendula	Germination: 7–14, Maturity: 45–60	6.0–7.0	1.0–1.6	12–14 hours	59–70°F (15–21°C)	Aphids, Whiteflies, Thrips	Powdery Mildew, Root Rot	Strawberry blonde is my personal favorite.
Celery	Germination: 10–21, Maturity: 80–140	6.0–7.0	1.8–2.4	12–14 hours	59–70°F (15–21°C)	Aphids, Thrips	Root Rot, Botrytis, Downy Mildew	Celery is 95% water, and its high water content makes it a great candidate to grow hydroponically.
Chervil	Germination: 10–14, Maturity: 40–50	6.0–7.0	1.0–1.4	12–16 hours	50–70°F (10–21°C)	Aphids, Whiteflies	Powdery Mildew, Root Rot	
Chives	Germination: 10–14, Maturity: 50–70	6.0–7.0	1.4–2.0	12–16 hours	57–75°F (14–24°C)	Thrips, Aphids	Downy Mildew	
Cilantro	Germination: 7–14, Maturity: 30–60	6.0–6.5	1.2–1.8	14–16 hours	50–81°F (10–27°C)	Aphids	Powdery Mildew, Damping-off	Cilantro is full of saponins. To some people, cilantro tastes soapy because of genetic factors.

Cucumber	Germination: 3–10, Maturity: 50–75	5.5–6.6	1.7–2.5	12–16 hours	64–75°F (18–24°C)	Aphids, Spider Mites, Whiteflies	Powdery Mildew, Downy Mildew, Root Rot	Choose a parthenocarpic variety so you don’t have to hand pollinate.
Cumin	Germination: 7–14, Maturity: 90–120	7.0–7.5	1.0–1.6	12–16 hours	64–86°F (18–30°C)	Aphids, Spider Mites	Powdery Mildew	
Dill	Germination: 10–14, Maturity: 50–65	5.5–6.5	1.0–1.6	14–16 hours	59–77°F (15–25°C)	Aphids	Powdery Mildew, Damping-off	Dill can get floppy as it grows and benefits from having some form of support to keep it upright.
Eggplant	Germination: 7–14, Maturity: 80–100	6.0–7.0	2.0–3.5	14–18 hours	69–84°F (21–29°C)	Aphids, Whiteflies, Spider Mites, Thrips	Verticillium, Wilt, Powdery Mildew, Root Rot, Botrytis	
Endive	Germination: 5–10, Maturity: 44–55	5.5–6.5	1.8–2.4	12–16 hours	50–72°F (10–22°C)	Aphids, Whiteflies	Damping-off, Downy Mildew	
Fennel	Germination: 7–14, Maturity: 80–115	5.5–6.8	1.4–1.8	14–16 hours	59–77°F (15–25°C)	Aphids	Root Rot, Damping-off	
Green Onions	Germination: 7–14, Maturity: 60–80	6.0–6.5	1.4–1.8	12–16 hours	55–75°F (13–24°C)	Thrips, Onion Maggots	Downy Mildew, Pink Root	If you harvest them 1–2 inches (2.5–8cm) above the base, they will keep growing back.
Holy Basil (Tulsi)	Germination: 7–14, Maturity: 70–90	6.0–7.5	1.0–1.6	14–16 hours	68–86°F (20–30°C)	Aphids, Spider Mites, Whiteflies, Thrips, Fungus Gnats	Downy Mildew, Powdery Mildew, Root Rot, Botrytis	
Kale (Dwarf)	Germination: 5–10, Maturity: 50–75	5.5–6.5	1.5–2.5	12–16 hours	50–75°F (10–24°C)	Aphids, Cabbage Worms, Flea Beetles	Clubroot, Powdery Mildew	Regular kale can grow very tall so make sure to search out a dwarf variety.
Kohlrabi	Germination: 5–10, Maturity: 50–70	6.0–7.5	2.0–2.5	12–14 hours	50–75°F (10–24°C)	Aphids	Downy Mildew	
Lavender	Germination:	6.5–7.5	1.0–1.4	12–16 hours	64–75°F (18–	Whiteflies,	Root Rot	

	14–28, Maturity: 150–180				24°C)	Aphids		
Lemon Balm	Germination: 7–14, Maturity: 70–90	6.0–7.5	1.0–1.4	12–14 hours	64–75°F (18–24°C)	Aphids, Spider Mites	Powdery Mildew	This is a great one to keep out of your outdoor garden because it spreads very easily.
Lemongrass	Germination: 10–21, Maturity: 70–90	6.0–7.5	1.2–1.6	12–16 hours	68–86°F (20–30°C)	Aphids, Spider Mites	Root Rot	
Lettuce	Germination: 4–10, Maturity: 30–50	5.5–6.5	0.8–1.2	12–16 hours	50–72°F (10–22°C)	Aphids, Thrips, Whiteflies, Fungus Gnats	Root Rot, Downy Mildew, Powdery Mildew	This is one of the best plants for a newbie. Lettuce grows exceptionally well in a hydroponic environment and produces quickly.
Marjoram	Germination: 7–14, Maturity: 60–90	5.6–6.5	1.2–2.0	12–14 hours	65–75°F (18–24°C)	Aphids, Spider Mites, Thrips, Whiteflies	Root Rot, Powdery Mildew, Downy Mildew, Botrytis	
Melon	Germination: 5–7, Maturity: 30–40	5.5–6.5	2.0–2.5	14–16 hours	70–85°F (21–29°C)	Aphids, Fungus Gnats, Whiteflies, Spider Mites	Root Rot, Powdery Mildew, Downy Mildew, Fusarium Wilt	You will need to manually pollinate or you won’t get any fruit.
Microgreens	Germination: 2–7, Maturity: 7–21	5.5–6.5	0.8–1.2	12–16 hours	60–75°F (15–24°C)	Fungus Gnats, Aphids	Damping-off, Mold	You will need to manually pollinate or you won’t get any fruit.
Mint	Germination: 10–15, Maturity: 60–90	5.5–6.5	1.5–2.5	12–16 hours	65–75°F (18–24°C)	Fungus Gnats, Aphids	Spider Mites, Aphids, Whiteflies	Another one to keep out of your outdoor garden, as it will spread and spread!
Mustard Greens	Germination: 4–7, Maturity: 40–50	6.0–7.0	1.5–2.5	12–16 hours	60–75°F (15–24°C)	Flea Beetles, Aphids, Cabbage Loopers	Alternaria Leaf Spot, Downy Mildew	
Okra (Dwarf)	Germination: 7–14,	6.0–6.8	2.0–3.0	14–16 hours	75–95°F (24–35°C)	Aphids, Whiteflies	Fusarium Wilt,	Look for a dwarf variety, such as Dwarf

	Maturity: 50–65						Powdery Mildew	variety, such as Dwarf Long Green Pod, Baby Bubba, Dwarf Cowhorn, Blondy Dwarf Okra, or Dwarf Leaf Okra. Even the dwarf varieties grow between 24" and 48" (61 and 122 cm) tall, so be sure you have enough height available. I would save this for an AeroGarden Farm XL or other large system.
Oregano	Germination: 7–14, Maturity: 60–90	5.6–6.5	1.2–2.0	14–16 hours	65–75°F (18–24°C)	Spider Mites, Aphids	Powdery Mildew, Damping-off	
Parsley	Germination: 14–21, Maturity: 60–90	5.5–6.5	1.5–2.0	12–16 hours	60–75°F (15–24°C)	Aphids, Thrips, Leaf Miners	Damping-off, Powdery Mildew	I always keep this one on hand to use when I make Italian wedding soup.
Peas (Dwarf)	Germination: 7–30, Maturity: 50–70	6.0–7.0	1.2–2.0	12–16 hours	55–70°F (13–21°C)	Aphids	Powdery Mildew, Root Rot	
Peppers	Germination: 7–14, Maturity: 70–100	5.5–6.5	1.8–2.8	14–18 hours	70–80°F (21–27°C)	Aphids, Thrips, Whiteflies, Spider Mites	Powdery Mildew, Bacterial Spot	
Purslane	Germination: 5–7, Maturity: 30–50	5.5–6.5	1.0–2.0	12–14 hours	65–75°F (18–24°C)	Aphids	Damping-off	You can normally find this on your front lawn, and you probably thought it was a weed!
Radishes	Germination: 3–7, Maturity: 25–40	5.5–6.5	1.2–2.0	12–16 hours	55–75°F (13–24°C)	Aphids	Damping-off	If you are looking for a quick harvest, this is it! I like to have 4 to 6 weeds per pod.
Rosemary	Germination:	5.5–6.5	1.2–2.0	14–16 hours	65–75°F (18–	Spider	Powdery	Rosemary is a

	14–28, Maturity: 80–100				24°C)	Mites, Whiteflies, Aphids	Mildew, Root Rot	slow starter when it comes to germination. Don’t give up too soon!
Sage	Germination: 10–21, Maturity: 70–90	5.5–6.5	1.2–2.0	12–16 hours	65–75°F (18–24°C)	Spider Mites, Thrips, Aphids	Powdery Mildew	
Savory	Germination: 7–14, Maturity: 60–75	5.5–6.5	1.2–2.0	12–14 hours	65–75°F (18–24°C)	Aphids, Whiteflies	Damping-off, Powdery Mildew	
Spinach	Germination: 7–14, Maturity: 40–60	5.5–6.5	1.8–2.3	12–16 hours	55–70°F (13–21°C)	Aphids, Leaf Miners, Thrips	Downy Mildew, Root Rot	
Stevia	Germination: 7–14, Maturity: 90–120	5.8–6.2	1.2–2.0	12–16 hours	65–80°F (18–27°C)	Aphids, Whiteflies, Thrips	Root Rot	
Strawberries (Alpine & Everbearing)	Germination: 7–21, Maturity: 90–120	5.5–6.5	1.2–1.8	12–16 hours	65–75°F (18–24°C)	Spider Mites, Aphids, Thrips	Botrytis, Powdery Mildew	
Summer Squash (Zucchini)	Germination: 5–10, Maturity: 50–70	6.0–6.5	1.8–2.4	12–16 hours	68–82°F (20–28°C)	Squash Bugs, Aphids, Spider Mites	Powdery Mildew, Downy Mildew	
Swiss Chard	Germination: 5–10, Maturity: 50–65	6.0–6.5	1.8–2.3	12–16 hours	60–75°F (15–24°C)	Aphids, Leaf Miners	Damping-off, Leaf Spot	
Thyme	Germination: 14–28, Maturity:	5.5–7.0	0.8–1.6	14–16 hours	59–75°F (15–24°C)	Spider Mites, Thrips	Root Rot, Powdery Mildew	
Tomatoes	Germination: 5–10, Maturity: 60–90	5.5–6.5	2.0–3.5	14–18 hours	64–81°F (18–27°C)	Aphids, Whiteflies, Spider Mites, Thrips	Botrytis, Fusarium Wilt, Root Rot	
Watermelon	Germination: 7–14, Maturity: 80–100	5.8–6.5	1.5–2.5	12–16 hours	72–86°F (22–30°C)	Aphids, Whiteflies, Cucumber Beetles	Fusarium Wilt, Powdery Mildew	Watermelon requires manual pollination for fruit to form.
Winter Squash	Germination: 7–14, Maturity: 80–110	6.0–6.8	1.8–2.4	12–16 hours	68–82°F (20–28°C)	Aphids, Whiteflies	Powdery Mildew, Downy Mildew	I am currently trying out some mini pumpkins. They have to be hand pollinated, and they take over!

WHAT ABOUT WEED?

Since I live in Canada where growing cannabis is legal, I am often asked about how to grow it in systems at home. While I don't grow it myself, these are some things to consider if you want to try growing it (and assuming it is legal where you live).

Most store-bought units will be too small in grow height for cannabis plants, as they can grow quite tall and wide. I would only consider growing cannabis in an AeroGarden Farm 12XL or unit of a similar size, which allows for just under a 3 feet (1 meter) of grow height with no side-to-side competition. You will want to source plant varieties that are shorter than your grow height (ideally one that grows no taller than 2 to 2 ½ feet (½ meter) so that the top will not hit the grow lights.

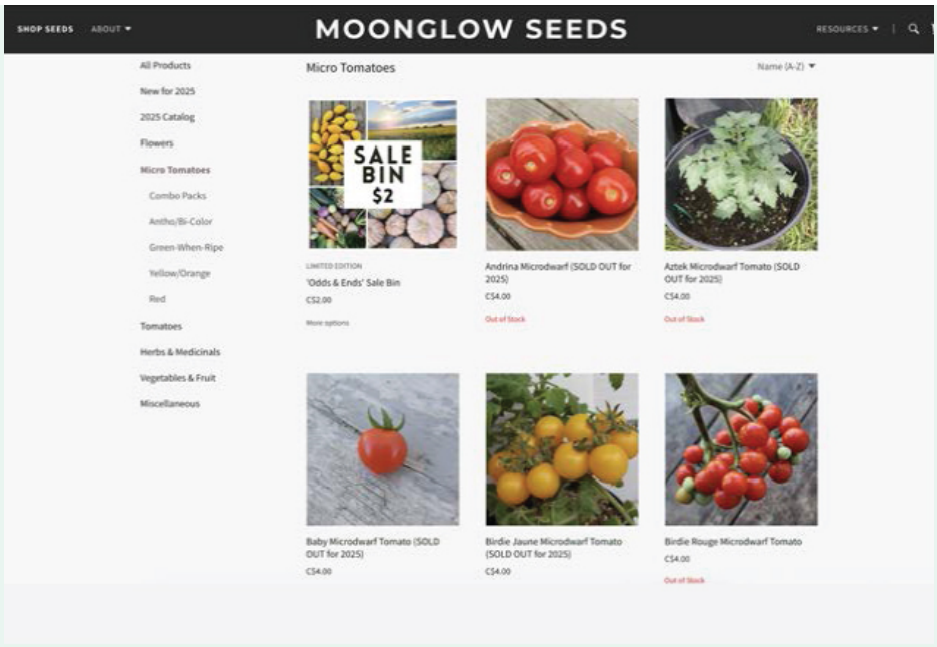
It is also good to buy autoflower varieties that are typically ready for harvest within 70 to 100 days, so you don't have to worry about changing your light cycles for the different stages of growth. The stems of these plants can be very stout and woody, so you'll have to ensure that they don't break your grow baskets or even your grow deck as they mature.

The Marvelous World of Micro Tomatoes

I've included this whole separate section about micro tomatoes because they have opened up a new world of growing potential for me. Suddenly, I was able to grow tomatoes in my itty-bitty AeroGarden Sprout! Just because they are small does not mean they are not mighty. You can get quite decent harvests off these little wonders, and there are so many options. Instead of only AeroGarden yellow tomatoes or red tomatoes, you can grow plum, green, black, salad, striped, and so many more. This chapter will introduce you to some of the varieties to get you started.

WHERE TO FIND MICRO TOMATO SEEDS

Micro tomato seeds are available from many outstanding retailers, especially online. The following are the places I love to purchase from. Some are in Canada, some are in the USA, and one is in France. These are the sources I go back to time and time again.



Moonglow Gardens stocks a great variety of micro tomatoes.

- Moonglow Gardens (Alberta, Canada)
- West Coast Seeds (British Columbia, Canada)
- Wild Boar Farms (California, USA)
- Baker Creek Heirloom Seeds (Missouri, USA)
- MI Gardener (Michigan, USA)
- Renaissance Farms (Indiana, USA)
- Secret Seed Cartel (France)

WHAT ARE MICRO TOMATOES?

Micro tomatoes are ultra-compact and fast-growing tomatoes. They are perfect for small pots and hydroponics and are a great way to have tomatoes growing year-round in even the smallest system! Other tomato types can get unruly indoors. Certain micro tomato varieties may need some light pruning and staking (I'm looking at you, Laura #5) due to how much fruit they produce. As with anything produced through hybridization/selective breeding, the goal can be a trait that isn't always taste, so some varieties are more visually interesting than they are tasty.

Micro tomatoes are small but mighty! These ultracompact and fast-growing tomatoes are a great way to have tomatoes growing year-round in even the smallest system.

There are so many different colors of ripe micro tomatoes—yellow, red, black, and even green—so there is nothing boring about growing them!

MICRO TOMATO VARIETIES

NAME	HEIGHT	FLAVOR	FRUIT COLOR	COMMENTS	OPEN POLLINATED	DAYS TO MATURITY
Blue Room/Blau Zimmertomate	12"	Sweet, Fruity	Red with Purple Shoulder When Exposed to Good Light	High in anthocyanins, larger than cherry tomatoes	Yes	65
Dark Striped	15"	Sweet, Balanced	Bi-colored, Brown & Green	Very few seeds, making it a more rare micro dwarf	Yes	65-75
Fat Frog	10-14"	Super Sweet	Green	Green when ripe	Yes	55-60
Golden Hour	10-20"	Sweet, Fruity	Yellow w/Anthocyanin Striped Shoulders	Oval roma, crack resistant, lower acid	Yes	65-75
Inkspot	10-12"	Sweet, Tangy	Purple with Red Shoulders	Supposed to be one of the best-tasting micro tomatoes	Yes	60-90
Jochalos	4-8"	Sweet, Fruity	Yellow	Early maturing	Yes	55
Laura #5	6-2"	Mild, Sweet	Red	Very prolific, teardrop-shaped fruit, more fruit than foliage	Yes	55-64
Litt'l Bites Cherry	12"	Sweet	Red	From England, 20" wide, great for hanging baskets, F1 hybrid	No	65
Lil' Peeps	12"	Tangy-Sweet	Yellow	Heart shaped with a pointy tip, need to be harvested when fully ripe for best texture and flavor	Yes	55-60
Micro Tina	15"	Very Sweet	Red	Created for the International Space Station	Yes	50

Mini Marzano	10-20"	Classic Red Tomato Flavor	Red	Paste tomato, oval, crack-resistant fruit, very productive	Yes	70
Mini Siam	7-9"	Sweet, Sour	Red	Developed for containers and small spaces	No	70-84
Monetka	8"	Sweet	Yellow	One of the best tasting, heavy producer	Yes	65
Orange Hat	6-9"	Sweet, Fruity	Orange	Very prolific	Yes	70-84
Pinocchio	7"	Fruity Flavor	Orange	Thin skins, early maturing, best-tasting micro dwarf	Yes	70
Red Robin	8-12"	Flavorful Sweet	Red	High yields	Yes	50-70
Regina	10"	Sweet, Tangy, Well Balanced	Red	Sturdy plants	Yes	50-55
Rosy Finch	8-10"	Sweet, Tart	Pink	Not too many seeds, part of the “little Brody” series, which includes red robin & yellow canary, rare color in micro dwarfs	Yes	55-60
Tiny Tiger	Under 6"	Sweet with Some Acidity	Red & Yellow Striped	Large, ping-pong-ball-sized cherry tomatoes	Yes	65
Tiny Tim	10-12"	Sweet, Tart	Red	One of the earliest maturing	Yes	60
Vilma	12-20"	Sweet	Red	Can crack too much with water	Yes	65
Yellow Cup/Hahms Gelbe	6-12"	Sweetest When Fully Ripe	Golden Orange	Very flavorful German variety	Yes	75

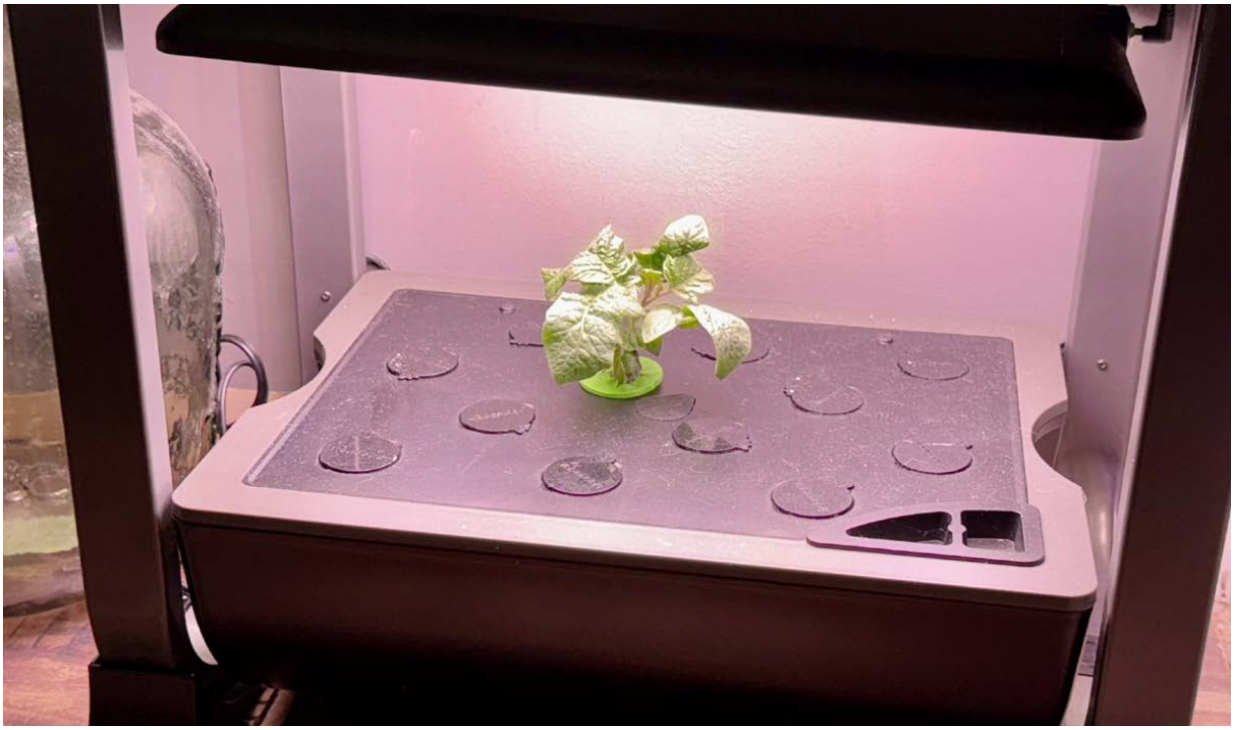
WHAT ABOUT TOMATOES FOR BIGGER SYSTEMS?

If you have a system with a taller grow height, you can grow larger varieties. Typically, people grow determinate tomatoes, which grow to about 3 feet tall, but there are so many more options if you start looking into dwarf varieties. I love the dwarf indeterminate ones, but let’s take a quick look at the difference between determinate and indeterminate tomatoes.

Determinate tomatoes tend to have a bush-like growing habit and generally don’t grow taller than 3-4 feet (90–120cm). They also tend to produce all of their fruit so that it ripens within two to three weeks. Roma tomatoes fall into this category, along with other sauce tomatoes, which makes perfect sense if you are growing tomatoes for the purpose of making large batches of sauce. They require less pruning and staking as well and can work well in outside containers.

Indeterminate tomatoes are the opposite of just about all the points listed above. They have a vining habit and will grow and grow, pretty much until the frost kills them in an outdoor garden. They can grow to be longer than 12 feet (3.66m), with some even longer than that! They require lots of pruning and staking to minimize the amount of space they take up and to provide enough support. They give their fruit as they grow, so you can harvest over a longer period of time. They are great for continuous tomato harvests but not suited for growing indoors hydroponically. Enter the dwarf indeterminate tomatoes. They are indeterminate, so they give fruit over their life as they grow, but they have been

dwarfed so you can grow them indoors hydroponically. I strongly suggest you check them out, paying close attention to the maximum grow heights listed for each variety.



I bought my AeroGarden Farm XL soley to grow full-sized tomatoes year-round. Just make sure to select a dwarf indeterminate variety. I am currently growing Tastywine.

CHAPTER 8 - STARTING YOUR SEEDS

Seed starting is, for me, one of the most exciting parts of growing, as you anticipate all the possibilities of your future harvest. I love trying different varieties, like these gorgeous red Welsh bunching onions.

Up to this point, we have looked at how to choose the right hydroponic system for you, the main parts of a hydroponic system, how to set them up,

and even how to decide what to grow. Now we need to shift our focus to the seeds that will start our indoor growing adventure and the things you want to consider when planting them to set yourself up for success.

How Many Seeds to Sow

In general, we want one plant per pod (with two exceptions), but I like to plant two seeds per pod in case one doesn't germinate. That way, you are not starting from scratch a week or two later. If you are using preseeded pods, you don't have to worry about this. Most of them come with even more than two seeds to ensure they grow for you. If you are using Rise Gardens pods, they have a lot of seeds in their preseeded pods. I carefully remove the foil, making sure to keep the pod upright, and then remove any extra seeds beyond two. I save the extras for later.

Using a Nursery

The idea of a nursery is to have an area for the seeds to germinate. Usually, there is a base and a cover, and it helps the seeds get started outside the main unit that has big plants and nutrients in it. Some systems come with a nursery to start your seedlings, others don't. It's definitely not a deal-breaker, and I don't always use a nursery. If you have a nursery, however, I would use it as a best practice. Going back to the good, better, best mentality, the nursery will give the seeds the humidity they need, access to plain water, and a spot away from the other more established plants.

It's also important to know that many people don't introduce nutrients until the first set of true leaves appears when they are starting seedlings. Even after that, the nutrients are usually at half strength. It's not that the nutrients will harm the seedlings but that they don't need it when they are just starting out. They have everything they need within the seed.

All that said, I have popped a brand-new seed pod right into the mix in the main unit, between other plants, with nutrients coursing through the

system, and they have grown just fine. The most important thing is always to just start planting a seed any way you can!

TIP:

I use 500mL mason jars as makeshift nursery covers, but you can use 16 oz. jars, or even smaller 250mL jars. The point of the jar is to trap humidity to help the seeds germinate. You can use any variety of jars, glasses, or plastic containers, as long as there is space for the seed to start growing and you can see what's going on inside.

Rise Gardens doesn't use domes; they rely on their nurseries that hold four pods. If I am starting more, I tend to use inverted 500mL mason jars and start seedlings in the grow decks of the unit.

Where the Heck Are My Plant Babies?

There is something truly exciting about seeing a seed you planted spring to life. After more than 10 years growing food indoors, I *still* get excited every time I see a new plant baby come into the world! When you are starting out, it can seem like it takes *ages* for your new plant babies to show themselves.

Radishes, such as the French breakfast radish, can germinate in 5–7 days and are ready to harvest in 25–30 days! Whereas parsley (which often comes as a starter seed with many systems) can take a whopping 14–28 days to germinate! You could easily be harvesting radishes before you see any sign of life from your parsley! Knowing how long to expect before you see proof of life is a good start. Even then, you have to remember that this is just an estimate, and the seed in question may have missed the memo on when it was expected to show up. I always leave mine for at least an extra two weeks past the expected germination date before I reseed. Some are just slow starters.

If you are buying preseeded pods, there is always the chance that the pod in question is seedless. It happens, even seeding machines make mistakes. On the plus side, you still have a pod that you can put something else in. Just let it dry out, and then you can start the process again. Also, sometimes, seeds just don't germinate. Maybe they were too old or maybe they were not fully mature. Just know that sometimes you can do everything right, and the plant still won't grow. Assuming there *is* a seed in the pod, let's look at a few things that affect the speed of germination and what we can do to ensure success.

DEPTH

If you are putting the seeds in the pods yourself, be careful not to plant them too deep. Seeds typically should be planted as deep as they are wide. If the seeds are planted too deep, they may use up all their available energy trying to get to the light source before they actually make it there.

The joy of new seedlings sprouting never gets old. Anytime I plant a new system, I check on them constantly and feel a sense of joy at the first new arrivals.

Some seeds will sprout roots higher up in the pod, especially when they are exposed to air, and people can confuse them with mold. Mold will smear if you touch it, root hairs will not.

TEMPERATURE

Seeds have a preferred germination temperature, and it will differ based on variety. A good rule of thumb is to keep the temperature between 65 and 75°F (18 and 24°C). Being hotter or colder than this could affect the rate of germination. Unless your house or the water in your system is incredibly hot or cold, temperature should not be a big issue. In systems where an upper level of water runs over the lights of the level below (like Rise Gardens), the increase in temperature can sometimes be a factor.

MOISTURE

Sometimes the pod is not wet enough, so the seed does not have the moisture necessary to germinate. Now you may be wondering, how the heck could a pod not be wet enough in a hydroponic system? I have found that if you fail to level a unit, especially an AeroGarden that relies a lot on the drip method, then the bottoms of the pods can dry out, especially if the water level is a little low. Make sure you level your system and presoak the pods before you put them in the baskets.

When humidity is lower than ideal, the seed pod can get stuck on the growing seedling. It's often called "helmet head." While shown here with a sunflower, it happens quite frequently with peppers.

HUMIDITY

Humidity is one of the most important factors for seed germination, but it's a recipe for disaster past the point of germination. This is why just about every kit comes with grow domes or nurseries with covers—so the humidity can be increased. However, you need to remove the domes once you see that germination has occurred because humidity can breed disease. Another reason to remove them is to avoid condensation forming. If one of the delicate leaves touches the dome, and water is trapped between the two, it can lead to the burning of those delicate leaves.

The one exception (because in gardening and in life, there are always exceptions) is peppers. They are prone to having the seed head stick, and some people call it "helmet head." It can also happen to tomatoes. Leaving the domes on a bit longer to keep that humidity higher can help the seedling head come off. Please, please resist the urge to try to pull the seed head off. Trust me, I have done it. It is much better to leave the dome on a bit longer than accidentally pulling off the top of your pepper!

Prepping Your Seed Pods

Before we put any seeds in any pods, we have to prep the pods. I like to soak the seed pods before I put them in the unit. This applies whether they are preseeded or seedless. The only difference is in how carefully I soak them. If they are seedless pods, you can just grab a large container, throw them all in, and leave them until they have absorbed the water. If they are preseeded, you need to keep them upright and watch how much water you put in at a time, so they don't fall over. If you are using skinny pods or sponges, a mason jar can be really helpful.

Presoaking pods is a great way to ensure they will wick up moisture. If they are preseeded, be very careful that you don't knock out any seeds.

The negatives of planting in all the holes isn't apparent until things start growing and taking over. This lesson is learned the hard way by most new indoor growers.

Let Them Breathe!

This section applies to systems that have a flat growing deck. In vertical systems, the holes are generally well spaced, and the height differences mean you can plant in all the spaces. In a flat growing deck, however, just because you have three, six, nine, or more holes does not mean you should plant in them all! Plants start so itty bitty, but everything can quickly become overcrowded, and pests and diseases can show up to take advantage of the less-than-healthy plants. Instead, don't plant in every hole, and make use of hole covers, golf balls, or something opaque to close off the empty holes. Below are my suggestions for how many holes to plant. Use it as a starting guideline and adjust based on your own experience and the space requirements of the plants you're growing.

- **Three-hole system:** Leave the middle hole empty.

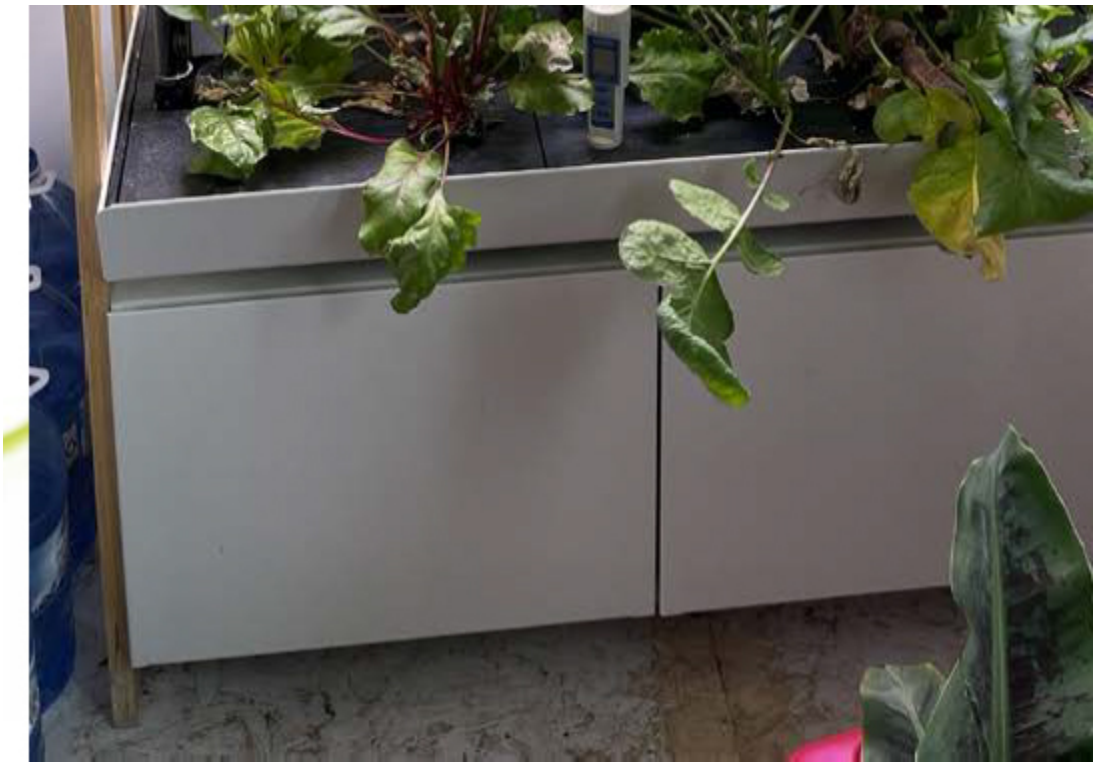
- **Six-hole system:** Leave two holes empty.
- **Nine-hole system:** Leave four holes empty.
- **12-hole system:** Leave nine to 10 holes empty if you are growing fruiting plants.

Location, Location, Location

We've talked about the location of your system, but with planting, we also need to talk about the location of the plants within the unit. Trust me, you will thank yourself later if you take a second to consider where everything is going to go while they are just seeds. Some plants grow tall, some are slow starters, some like to sprawl, and others have a wide footprint and tend to take up all the space. Thyme and parsley are super-slow starters, and you don't want them getting crowded out by fastergrowing plants. Cabbage has big lower leaves that take up a lot of real estate. Cucumber or melons like to sprawl, and will need some trellises to grow up. Basil grows fast and gets huge when grown hydroponically.

Much like you would make a garden plan for an outdoor garden, you can make one for an indoor garden. Some of the apps also have layout features that you can also use. The nice thing about doing it on paper is you can keep the history of what you grew where for future reference. Remember to consider both the horizontal and vertical space available. What plants grow tall vs. short? Thyme, for example, will always stay quite low whereas a cherry tomato or dill can get quite tall.

In a system like AeroGarden, I tend to put the tall plants in the back and the shorter plants in the front. With slim models, I tend to put the tall plants on both ends. In the Farm models, where I would grow bigger and taller plants like peppers, tomatoes, or eggplant, I usually plant only one per side! If you have a tiered model like a Rise Gardens that offers different grow heights on different levels, be sure to put the small plants on the higher levels and the taller plants below. Basically, you want to keep larger plants out of the way so they don't block your access to any smaller plants.



I love the ability to grow on multiple levels that Rise Gardens offers with their multitiered systems.

I have found that brassica cotyledons (seed leaves) have a lobed structure. This is known as reniform or kidney shaped and are different from the true leaves.

True Leaves?

As we talked about earlier in this chapter, the leaves that you will see when your plant babies first emerge are not true leaves; they are called cotyledons. There are two main types of plants: monocots (like corn), which have one cotyledon, and dicots (like beans, tomatoes, and peppers), which have two. Cotyledons are seed leaves that are within the seed itself, and they tend to look different than the true leaves of the plant. They help the plant by providing enough food for the seedling to become established, and they can photosynthesize until the plant can create its first true leaves and really start photosynthesizing. They fall off when they are no longer

needed, so don’t worry if you see this happen once the first true leaves appear.

Most systems come with stock nutrients. These are great to start with (or keep using), but you can also branch out after you have gained confidence in your ability to grow food indoors.

Introducing Nutrients

Once you see those true leaves appear, it’s a good time to start introducing some nutrients. Either move the seedling from the nursery to the main system or add nutrients to the system if you had them in the unit in plain water.

The “one and done” nutrient solutions are added to your system after germination and throughout the life of the plant. AeroGarden suggestes adding nutrients on a 14-day cycle and Rise Garden systems prompt users to add nutrients every 7 days. Their app recommends how much to add of the different types available.

A NOTE ON PLAIN WATER

Plain water is never a good idea for growing germinated plants, as it has nothing in it to support plant growth. I don’t add nutrients in the first two weeks of germination, however, because the seeds themselves contain enough nutrients to get the plants growing. Adding nutrients at this stage won’t do any harm, but is a bit of a waste.

Plain water is fine for presoaking and in the nursery stage. Just be sure to move plants out of the nursery once they have germinated and have their first set of true leaves. If these plants are left in plain water too long, that it will negatively affect them.

If you are testing the EC, you’ll have a much better idea of when to add nutrients. The nutrients in each solution are included in different amounts and concentrations in the different brands available, so be certain to read the manufacturer’s recommendations on your chosen brand for feeding guidance.

The Importance of Thinning

It is easy to think that with more plants you are going to get a bigger harvest. For many years I leaned into this and didn’t thin all my plants. For shame, I know, but I will always admit my mistakes! Bigger ones like tomatoes and peppers I did but leafy greens I always let more than one grow, until I didn’t one time and WOW what a difference!

Once your seedlings have two to three sets of true leaves, it is time to thin your plants so that you only have one plant per pod. It is painful to do,

but it will ensure that you have a healthier plant and a bigger harvest. You can also try to replant the sacrificial seedlings. When removing excess seedlings, always pull them out by hand and try to grab them as low on the stem as possible. Pull them out very slowly to have the best chance of also pulling out some useful roots (and getting a viable seedling to replant).

THINNING TIPS

- Thin all plants to one per pod unless you're growing something like radishes that can be multisown.
- Tomatoes are the hardiest things ever, so even if you don't pull any roots with your thinned seedling, you can pop them in some soil and they should be fine in a few days.
- If you pull any plant seedling out and there are no roots, still try putting it in some water to see if it will grow.

Track Your Data

Your house environment, much like your outdoor garden environment, is not the same as everyone else's. Data is key to successfully growing your own food! It doesn't have to be overly complex. Keep it simple, whether that's a little notebook or a notes app on your phone. Whatever method you use, record what you did and how it went because this sort of information is invaluable over time. If you get more into growing hydroponically or want to try different nutrients or nerd out on pH, then data, my friends, it truly where it's at.

CHAPTER 9 - WATER TESTING

Electrical conductivity (EC) and pH are two important values when it comes to water for your system.

We finished off the last chapter talking about data, and it is so important I am going to reiterate it. As we step though this chapter and look at all the key elements of water testing to ensure plant health and epic harvests, each item is an opportunity to gather data. If you haven't started tracking your data, now is the time to start! Having data to review and reflect back on is

one of the best ways to grow as a gardener. It doesn't matter if you are growing indoors or outdoors.

Let's talk all about water. In the beginning, it can seem like you never really need to top off your tank. Then, as your plants grow, it seems like you need to do it every 5 minutes. Making sure there's enough water in the reservoir is important for a multitude of reasons—you don't want your roots to dry out, your pump to be damaged, or your nutrient concentration to be incorrect. Many systems have an indicator to show when the water level has dropped too low, but it won't help if you don't see it. Some apps will send you a notification, which is helpful. You can also set up a repeating reminder in your phone to check the water level. Whenever you add water, you'll need to check the nutrient solution so that you don't dilute it and impact the health of your plants. We'll cover all of these things in this chapter.

This is a good example of when you definitely need to change the water. Even if things look ok, it is a good practice to regularly change out the water in your system.

When to Change the Water

Not changing your water enough, especially if you are not doing proper water testing, can be a recipe for disaster. Even if you started out with a balanced solution, things will get out of whack, and your plants will suffer over time. There are multiple factors to take into account: the size of your system, types of plants, stage of growth, and water quality. As plants grow, you will have add water more frequently and often change the water more frequently. Here's my good, better, best approach for changing the water:

- ✔️ **GOOD:** Change it with every monthly cleaning
- ✔️ **BETTER:** Change it every two weeks
- ✔️ **BEST:** Change it when the EC and pH readings indicate a change is needed

Testing Goals

Water testing will help your indoor plant babies thrive. It can seem daunting, but it doesn't have to be. As I mentioned before, it was years into my indoor growing journey before I started testing, and even if you don't test, you will be able to grow food indoors.

There are three main things we want to keep tabs on with our nutrient solution: pH, EC, and temperature. We will take a look at what they are, why they matter, and how you can keep track of them. We will start with pH, because if you only start with one, this one will give you the most bang for your buck!

IT'S ALL ABOUT THE PH

The pH tells us the balance of the nutrients in the solution. Don’t put too much stock into nutrient solutions that are “pH buffered.” It’s not a good reason to skip testing your pH! The range for pH goes from 0 to 14, with 7 being neutral, 0 being acidic, and 14 being alkaline. The general target range for our purposes is between 5.5 and 6.5.

Each plant has its own sweet spot when it comes to pH. While there is some overlap, the pH to aim for will depend on what you are growing. If you have a little bit of everything in your system, then aiming for the generic target zone is probably best. If, however, you are growing all the same type of plants or if you can dedicate smaller systems to a single type of plant, then you can run different pH levels in each system. This is one of the benefits of having multiple systems.

There are quite a few options when it comes to tools to test pH. They range from cheaper options, like pH strips or liquid testers (like Root Farm), to expensive pens (I love Bluelab) and machines. Some pens can do EC and pH, which may be a good option. Personally, I prefer tools that do one thing (with pH or EC). Just remember, it is better to test with one of the cheaper options than to not test at all.

AUTO OFF
Hold
Cal
Units
Bluelab pH Pen

This pen was an investment, but I was happy to make it. I had tried cheaper pH pens, and they never seemed to work well. Whatever you use, the most important thing is that you get in the habit of checking the pH of your nutrient solution.

A NOTE ON WATER TEMPERATURE

You can usually measure the temperature of your water with your pH or EC pens. The temperature should display whenever you take a reading. I haven't ever encountered temperatures that I needed to remedy and mostly leave my water temperature alone.

If high water temperature is a consistent issue for you, try adding an aquarium fan, or a water chiller (although water chillers are very expensive and more than your average person would need). Some people even add ice cubes to their water, especially if they are growing lettuce.

HOW TO TEST YOUR PH

Now let's take a look at how to actually test the pH of your nutrient solution.

1 **Make sure that the EC is within the target range (optional).** If you are checking both EC and pH, check your EC first. If you are not yet ready to check EC, skip to step 2.

2

If you are using a pH pen, calibrate it. If you are using test strips or a liquid pH, such as Root Farm pH Test Kit, skip to step 4. If you are using a pH pen, you will need to calibrate it before *every* use. Your pen should have come with calibration solutions, so mix these up following the directions. There are typically two or three solutions—often pH 4.0 and pH 7.0.

3

Start with the pH 7.0 solution first. Swirl the pen in the solution and wait until it takes a reading. Once the pen is calibrated to a pH of 7.0, rinse the probe tip off in clean tap water.

4

Calibrate the pen to pH 4.0 using the pH 4.0 solution and the same method. Rinse the probe tip with clean tap water. Don’t skip the calibration steps! Checking your pH with an incorrectly calibrated pen can do as much damage as not checking your pH at all.

5

Make sure the nutrient solution in the reservoir is properly mixed. It is a good idea to make sure the nutrient solution is mixed before testing so that the reading is representative of the entire mix. I like to run the pump before I test.

6

Dip the pen or test strips into the solution. If you are using the liquid tester, take a sample from the reservoir, put it in the test vial, and add in the pH test indicator solution. Check your reading and determine if the pH is within the target zone. Remember to write down your results!

7

Adjust the solution if needed. If the pH is outside the desired zone, use pH Up or pH Down products to get it into the target zone. Be sure to add them a little at a time, mix them well into the solution, and then retest. Repeat the process until you have reached the target zone. Remember, a little goes a long way!

8

Clean all your equipment. If you are using a pen, store it per the manufacturer's directions. You may need to use a probecleaning solution and/or a KCl (potassium chloride) storage solution to make sure the probes do not dry out.

My Bluelab EC pen came ready to use out of the box and is more accurate than the less expensive model I had before.

THE IMPORTANCE OF EC

Electrical conductivity (EC) is an important indicator of the concentration of nutrients in your nutrient solution. If you are adding nutrients to the water and the EC is out of the target zone, your plants may not be receiving the right amount. EC is measured in microsiemens (µS) or millisiemens per cm (mS/cm), and plants do best within a range of 1 to 2.8 mS/cm. Pure water will register an EC of 0, as it does not contain any nutrients or minerals.

When we add nutrients, which contain dissolved salts, we can start to measure the EC of the solution we have created. As the amount of dissolved salts increases, so does the EC of the nutrient solution. EC definitely has a sweet spot of 1 to 2.8 mS/cm. Anything above or below will impact plant growth. Too little can mean stunted plants that are not producing well; too much can result in nutrient toxicity and unhealthy roots.

1 mS/cm = 1000 µS/cm | 1 µS/cm = 0.001 mS/cm

HOW TO TEST YOUR EC

Now that we know why we want to test the EC of our nutrient solution, the next logical question is how do I do that? In truth, it does require a bit more of an investment than testing for pH. You will need to get a conductivity meter or pen. Bluelab makes an EC/PPM pen (they also make a combo pH/EC pen), but get one that fits into your budget. It can be helpful to find an EC reader that compensates for temperature because the EC of a solution is significantly impacted by temperature. If the temperature of a solution goes up, so does the EC. Many EC meters will adjust the results to indicate what the EC would be at a temperature of 77°F (25°C). A good target temperature for your water is 72–75°F (22–24°C).

1

Calibrate your EC pen using the provided buffer solution. Place (or if it is powder, mix it per the directions and then place) some of the solution in a small container. Follow the manufacturer's directions to calibrate the pen.

2

Make sure the nutrient solution in the reservoir is properly mixed. Give it a good stir to make sure it is properly mixed before you take a reading. You can stir it up manually or go ahead and cycle the pump if your model allows for that function.

3 **Dip the EC meter into the nutrient solution and check your reading.** Determine if the EC is within the target zone, too high, or too low.

4

Adjust the solution if needed. If the EC is too high, add water, a little at a time, until the EC comes into range. If the EC is too low, add nutrients to the solution, again a little a time, until the EC comes into range.

5 **Clean your EC meter by running it under tap water.** Store it per the manufacturer's directions.

HOW OFTEN YOU SHOULD TEST

How often you check and how precise you are should be determined by your goals. Will you grow a better harvest if you are more precise? Most likely, yes. Will you grow food even if you never check or occasionally check your pH? Also, yes. I found that when I was checking it constantly (some people recommend doing daily), it started to take the enjoyment out of it for me. However, I always check when setting up a system, either for the first time or after any changing of the nutrient solution. The chart on the right should provide you with some ranges for common plants to help you in your journey.

TARGET pH AND EC FOR SOME COMMON PLANTS

PLANT	TARGET pH RANGE	TARGET EC RANGE

Lettuce	5.5–6.5	0.8–1.5
Herbs	5.5–6.5	0.8–1.5
Tomatoes	5.5–6.0	2.0–3.5
Peppers	6.0–6.5	2.0–3.5
Peas	6.0–7.0	0.8–1.8
Beans	6.0–6.5	1.8–2.4
Strawberries	5.0–5.5	2.0–3.5
Cucumbers	5.5–6.0	2.0–3.0

It is important to remember that additions, like Cal-Mag, can affect both your pH and EC. I like to add in everything before I do any testing and then adjust as necessary.

Other Additions to Your Nutrient Solution

There are a whole host of things you can add to your hydroponic solution, but I want to touch on two common ones. If you decide to use them, just

remember that each new addition can affect both the pH and EC of your solution. Be sure to check that everything is still within the target ranges.

CAL-MAG

Cal-Mag is a supplement containing calcium and magnesium, thus its name. Calcium is used by plants to support the cell walls, and it also helps with root development. Magnesium aids with plant photosynthesis. If we don't have enough calcium and magnesium in a hydroponic environment, it can lead to plant deficiencies that can cause stunted growth and other issues.

Calcium comes up a lot when talking about tomatoes because lack of calcium can cause blossom end rot. In an outdoor garden, it is not usually a lack of calcium in the soil that causes this rot. Instead, it is the result of inconsistent watering that impacts the plant's ability to take up calcium. It is a different story in hydroponics where issues could definitely be caused by a lack of calcium. Cal-Mag isn't, however, a silver bullet that will guarantee hydroponic success.

Some people also feel that hydroponic tomatoes taste watery or not very sweet. They find that the addition of a Cal-Mag supplement rectifies this issue. When I started, I never really added anything to my nutrient solution other than the stock nutrients that came with my systems. I still managed to grow tomatoes that tasted great to me. If you choose to use Cal-Mag, it is important to measure out how much you are putting in—more is not necessarily better! Cal-Mag can also help prevent tip burn in lettuce.

HYDROGEN PEROXIDE

Let's take a look at why you may want to add hydrogen peroxide to your system.

It adds extra oxygen to the nutrient solution, making it harder for harmful bacteria to thrive.

It can help stimulate root development and nutrient uptake.

It can help prevent algae overgrowth.

It has anti-microbial properties and can help control or kill some viruses, bacteria, and fungi.

If you do decide to add hydrogen peroxide (H_2O_2) to your nutrient solution, make sure it is a food-grade variety. You also want to make sure that it is a 3% solution. It should be kept in a dark bottle because exposure to light will cause it to break down. When adding it to your nutrient solution, use 1 tablespoon (15ml) per gallon of reservoir water. As with anything new you may be adding, track the data on how much you have put in, when it was added, and how your plants respond.

Essential
Oxygen
HP
FOOD GRADE
HYDROGEN
PEROXIDE
GRADE
ALIMENTAIRE
PEROXYDE
D'HYDROGÈNE
3%
USP
TOPICAL SOLUTION
SOLUTION TOPIQUE

If you are going to use hydrogen peroxide in your system, make sure it is food grade, which should be listed on the bottle.

CHAPTER 10 - CARING FOR YOUR PLANT BABIES

Now that your seeds are starting to grow, the real work and fun begins! In this chapter, we will look at some key things that will help those little plant babies grow into strong and resilient plants. We will chat about nutrients, pruning, support, and pollination as well as what to do if you need to take a vacation and can't find a plant sitter.

Nutrients

We've talked a bit about nutrients, but you may be wondering if your plants could grow with just water. If you have questions like this, it is always good to test them out and see! Doing so gives you more data, which is never a bad thing in my book. You'll find that the plants will grow, but they will not grow as big and strong. I conducted an experiment using my AeroGarden Sprouts to test out this exact scenario. I grew a micro tomato and cilantro in each Sprout. I wanted to see if the tomato suffered more than the cilantro without nutrients. My hypothesis was that there would be more of a burden on the tomato, as it needs to produce fruit and therefore would have higher needs for nutrients. You can see the difference the nutrients made in the picture on the bottom left. Both plants suffered.

Now that your seeds are starting to grow, you'll need to support their growth with nutrition, pruning, and pollination.

HOW MUCH TO FEED YOUR PLANTS

This is one of those things where more is not better! It is very important to follow the instructions on the nutrients that you have chosen to use. Please do not eyeball it and assume you can add nutrients in the same way you would disregard the directions in a recipe about adding garlic. Add them in the recommended amounts, and then you still need to test to make sure all is well in your system.

Plants need nutrients to thrive, but how much difference does it make? I tried growing with nutrients (on the right) and with just water (on the left) to compare.

HOW OFTEN TO FEED YOUR PLANTS

Most systems will have a visual prompt on the unit, such as a flashing light, to indicate that it is time to add nutrients. If the system has an app, it may also send you notifications to add nutrients (and low water alerts). AeroGarden has a function that prompts you to add nutrients 14 days after the last time you turned off the notification. This keeps it simple and is the best place to start for newbies, but it may not always be in the best interest of your plants. As you get more confident in your indoor growing, checking your pH and EC is a far better gauge of when to add more nutrients.

Directions for Use: Shake Bottle. Add plant food
into water bowl. The cap on the bottle holds 4mL of
food. Use this cap as a measuring tool when feeding
Use With Your AeroGarden
2 & 3-Pod Models
4 mL (1 capful) at startup and every 2 weeks
6 & 7-Pod Models
8 mL (2 capfuls) at startup and every 2 weeks
9-Pod Models
8 mL (2 capfuls) at startup/ 2nd feeding
12 mL (3 capfuls) every 2 weeks thereafter
12-Pod Models
16 mL (4 capfuls) at startup/ 2nd feeding
24 mL (6 capfuls) every 2 weeks thereafter
Use With Other Plants
Houseplants
2 mL (1/2 capful) per gallon for each watering
Outdoor Gardens
4 mL (1 capful) per gallon for each watering
DO NOT OVERFEED PLANTS More is not better
Store at room temperature 60-80°F (16-28°C)
Keep out of reach of children and pets. Do not ingest

On the back of your AeroGarden nutrients (or any other bottle of nutrients), you will find information on the concentrations of each nutrient that is included in your specific mixture.

Fox Farm has Grow Big formulas both for my outdoor garden (green label) and for my indoor hydroponic garden (blue label).

STOCK VS. OTHER NUTRIENTS

If you are going to use nutrients other than what was provided with your system, make sure that they are liquid nutrients intended for hydroponics. You don't want to introduce anything that could negatively impact your pump! There are many great options you can use. Some systems come with different levels of nutrients as well.

AeroGarden nutrients (which I have used for years) takes a one-size-fits-all approach. You use the same nutrients through the entire life cycle of the plant. The only difference is the amount you add based on the size of system you own. Rise Gardens has two different dry nutrient mixes: Sprout

and Blossom. One is for early-stage growth, and the other is for late-stage growth. With Click & Grow, there are no liquid nutrients to add because they have little pellets in their grow pods.

Other nutrient mixes are similar in category. If you are a one-size-fits-all kind of person, you could try something like Fox Farm Grow Big Hydroponic Liquid Plant Food. If you prefer to tailor the nutrients to the life cycle of the plant, you could try products like General Hydroponics FloraPro Series or Advanced Nutrients pH Perfect Grow, Micro, and Bloom.

This cilantro is getting too tall and is touching the light, so it's time for a pruning. In this case, I would just cut off the tops that are closest to the lights (haircut method).

A good, sharp pair of pruners is key to nice clean cuts that have less chance of inviting problems. Dull pruners can tear at plant tissue, which causes more damage.

Pruning

The point of pruning is to help keep things neat and tidy because space is a constraint when growing indoors. It also helps reduce the chances of pests and diseases taking hold. To be clear, even if you don't prune your plants, you will still get a harvest, but proper pruning is key to having healthier and more abundant plants! There are different ways to prune your plants to achieve different results, and we will look at each of those individually. I want to touch on two types of pruning: pruning your plants as they grow

and pruning your plant roots. Both can be overwhelming when you are first starting out, but they don't have to be.

The main thing you need to remember is that whatever tool you use for pruning must be clean and sterilized. A good, sharp pair of pruners is all you need. To sterilize your tool, use isopropyl alcohol (I use 99%) and a clean cloth or piece of paper towel. Put the alcohol on the cloth or paper towel and wipe down the blades. Not cleaning your tools properly can spread diseases and pests between your plants. Let's look at the good, better, best approach in terms of cleaning your tools:

- ✔ **GOOD:** Sterilize your tools before you start any pruning.
- ✔ **BETTER:** Sterilize your tools between each plant.
- ✔ **BEST:** Sterilize your tools after each cut.

Besides wondering *how* to prune, which we will cover in the next sections, you'll want to know *when* to prune. This question does not have a simple and straightforward answer. It will depend on what you are growing, where your plants are in their life cycle, and what you are trying to achieve. As a general rule of thumb, you should check your plants to see if they need any pruning when you do your monthly cleaning. You should definitely prune if they look like they are getting unruly and there is not much space between the plants.

PRUNING TO CONTROL SIZE

Any plant in your system that is getting too big and unruly should be pruned to control its size. When we grow hydroponically, especially in smaller systems, we may need to prune because we planted too many holes, we pushed the boundaries of the plants we are growing, or we have plants that are touching or almost touching the lights. In these cases, pruning takes

on more importance than it would in the outdoor garden. We are removing growth to get things back to a manageable state.

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1 **Wash your hands with soap and water.** We don’t want to spread diseases, and this is an easy step to help prevent that.

2

Clean and sterilize your tools with isopropyl alcohol.
Put isopropyl alcohol on a clean cloth and wipe down your tools to make sure they are clean and safe.

3

Look for leaves or branches that are getting too close to the light and remove them. Remember, we want to keep the lights 4–6" above the tops of the plants to prevent them from touching and burning. Having plants pass the lights will make those branches go leggy. Prune them down and let them bush out.

4

Look for leaves or branches that are encroaching too much on other plants and remove them. The crossing or overlapping branches of this pepper plant need to be removed to improve airflow. While it can feel like you are cutting off potential future harvests, you don’t want your garden to be too crowded, to have too little airflow, or to allow pests and diseases to jump from plant to plant. Sickly plants, regardless of their size, won’t give you much of a harvest. Prune them and keep them healthy.

5

Compost any cut branches and leaves. Unless you are removing branches with diseases or if you have pests, go ahead and compost whatever you remove to help build soil for your outdoor garden.

Your indoor harvest is something to be proud of, even smaller wins like pruning your fresh herbs to make dinner a special occasion.

PRUNING TO ENCOURAGE GROWTH

Plants like basil and peppers can benefit from a specific form of pruning that will create bushier plants and, in theory, give you more growth and harvests. As the plants grow, you can “top” them, basically remove the main growing stem at a node between two leaves. The plant will then redirect the growth hormones from the main stem that was removed to the side shoots below the cut. Deciding when and where to make the cut is important because the new Y-shape will have to support more leaves and fruit above it.

If you have an outdoor garden, you may have heard that it is not a good idea to top peppers. This is often true of you live somewhere with a shorter growing season (like I do in Canada). When we are growing indoors hydroponically, the growing season is essentially endless, so it can be a great time to experiment. If you have two peppers of the same variety, planted around the same time, try topping one and not the other. See if you get more growth on the topped one.

1 **Wash your hands with soap and water.** We don’t want to spread diseases.

2

Clean and sterilize your tools with isopropyl alcohol. A quick wipe is all you need, so don’t skip this step.

3

Consider if topping is necessary (especially for peppers). For peppers, it is best to wait until they are 6–8" tall. Your pepper plants should also have six to eight sets of leaves. Basil plants should have three to four sets. Another thing to consider is the type of peppers you are growing. I find topping works best for smaller (typically hotter) varieties. You don’t necessarily want a sweet bell pepper plant having a lot of fruit on top. It could cause damage to the type of plant.

4

Look for where to make the cut on the plant. I like to keep my cuts about 5" (12.5 cm) above the base of the plant. Look for a growth node that has some good offshoots. You want to make cuts close to a node for two reasons: You don’t want to leave a useless piece of stem sticking up, and cutting above the node will cause new shoots and leaves to form.

5 **Steel your nerves and make a 45-degree angle cut about ¼" (1 cm <h5a>) above the node.** Try to make sure you cut on a 45-degree angle. Flat cuts can invite issues.

6

Compost any cut branches and leaves. *Note:* You can keep trimming basil to encourage more branching, but I would only do it once for pepper plants. You will also want to watch basil for flowers that may be forming and remove those too. With most varieties of basil, once they start to flower, it changes the taste of the basil. When the flowers start forming, it indicates that the plant is starting to reach the end of its life. You should be able to keep it going a bit longer by removing those flowers.

If you need a pep talk before making this first cut, I'll tell you that I was terrified of topping until I had an unfortunate plant accident. I knocked a big syringe off my Rise Gardens, and it fell down and broke off the top stem of my lemon tree. This was no ordinary lemon tree; it was one that my mum had grown from a seed and gifted to me. I assumed I had done unrecoverable damage, but over time, the two side

shoots below the breakage point grew, and the tree is still growing great!

Suckers are capable of producing a whole new fruit-producing stem. If you want to control the size of your plant, then removing suckers is an option.

PRUNING TOMATOES

When it comes to pruning tomatoes, we're usually talking about removing "suckers," which are little growths that pop up in the "armpits" of a tomato plant. Outdoor gardeners were often advised to remove the suckers, leaving the main growing stem of the tomato plant, which would then produce larger and better-quality fruit. Recently, I have been seeing more people advise gardeners to leave the suckers on to get a bigger harvest. Because of our constraints with indoor gardening, however, we may need to remove the

suckers to keep everything manageable. It is also important to note that you only want to prune indeterminate tomatoes. Do not prune determinate tomatoes.

If you do end up needing to prune suckers from a plant, you can put these suckers into a glass of water or even just plant them in soil, and after looking a bit sad for a few days, they should start perking up, forming roots, and will turn into a clone of the original plant!

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1 **Wash your hands with soap and water.** As usual, we want to avoid spreading diseases.

2 **Clean and sterilize your tools with isopropyl alcohol.**
Don’t skip this step. The health of your plants can depend on the cleanliness of your tools.

3 **Look at all the tomato “armpits” and see if there are any suckers forming.** I (and many others) call them the armpits of the tomato, but basically you are looking for where the leaf branches come off the main stem.

4 **Remove any suckers that you don’t want.** You can remove none, all, or some. If they are tiny, you can usually pull them off. If they are a bit bigger, you will want to use sharp, clean pruners to make a clean cut. Note that the more you leave, the more pruning you will need to do to keep things under control.

5 **Compost any cut branches and leaves or use the discarded suckers to make more plants (clones) of the**

main plant. I just pushed this sucker into a grow sponge.

PRUNING AS A FORM OF HARVESTING

This form of pruning (sometimes called “cut and come again") applies mostly to lettuce and herbs that grow out of a central point, such as dill or cilantro. It is great because you are tackling multiple issues with one solution. You are harvesting your food as well as keeping things tidy and encouraging new growth. There are two main ways to approach this type of pruning:

Removing the outer leaves: In this method for lettuce or other leafy greens, you simply remove the outer leaves, leaving the growing center of the plant intact. If you eat a lot of greens, you may want to grow multiple plants to provide enough to support your family’s needs. For applicable herbs, the process is the same, but you are removing the outer stems.

Haircut method: This type of pruning involves grabbing the top leaves (like you are making a ponytail) and cutting off the top portion of the greens or herbs in a straight horizontal cut. When using this method, be sure to leave the bottom third of the plant intact. If you cut too low and damage the crown, the plant won’t be able to recover.

With both of these approaches, you are leaving the growing tip (crown) of the plant intact and only removing the mature leaves or stems. This allows the plant to keep growing and providing you harvests for a much longer period of time. The other option is to remove the whole plant, plant a new one, and wait for it to grow to a harvestable size before you would have anything to harvest. Regardless of the method you choose, make sure that your tools have been sterilized before you use them.

You can hang harvested herbs upside down to dry before storing them.

If you are going to trim your roots, do it carefully and avoid cutting the main taproot. This is definitely how NOT to do it! I took this picture for a YouTube thumbnail and did not actually cut the roots this way.

PRUNING THE ROOTS

You may not even have considered plant roots as something that would require pruning! Outdoors, this would be true, but when we are growing

indoors in a confined space, there are reasons that you may want to prune your roots.

It is a must to check on the root health of your plants at least at each monthly cleaning. We want roots to look strong and white. If they look slimy or brown, then we have an issue, and we'll touch on root health in a later chapter. Ideally, when we check roots monthly, we are assessing them for size. Are they crowding out other plants? Are the roots getting tangled in the pump? If the answer to either question is "yes," then you may want to consider a little trim. A word of caution, cleaning your tools is nonnegotiable when pruning below the grow deck! The chance of adding disease when pruning roots is much higher, so if cleaning your tools properly is not on your list right now, it is best to leave your roots alone!

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1 **Wash your hands with soap and water.** While you should wash your hands before any pruning, it is *especially* important when you are going to be handling your plant's roots!

2 **Clean and sterilize your tools using isopropyl alcohol.**
Do not skip this step when pruning below the grow deck. It is a recipe for disaster.

3 **Assess the roots of your plants and see if you need to cut them.** If they are getting into the pump or taking up the whole grow bowl, then it can be a good idea. Otherwise, leave the roots alone.

4 **Avoid touching the roots with your hands and carefully trim any outer roots.** I like to wear gloves when handling the roots. Avoid cutting the main central taproot (the big, long one in the center). Less is more when it comes to root trimming, so make sure to go slowly. Every cut is an open wound to the plant that could let in bacteria or disease.

Providing Support

Now, I don't mean support in an emotional way, though you may find that caring for plants does provide this back to you. I am talking about providing physical supports to help your plants grow strong and tall.

Some plants tend to grow tall and get all floppy (I’m looking at you, dill!), or due to their fruiting nature, they can get top heavy and need a bit of help. There are also the crawlers/take-over-the-system types, like peas, that need their own type of support system.

TRELLISES

If you are planning to grow anything like peas (unless they are Tom Thumb peas), cucumbers, or if you are adventurous, mini pumpkins, then it can be wise to invest in some form of trellising. Both AeroGarden and Rise Gardens have their own form of trellis, but you can also create your own using twine or buying/making a 3D-printed one that fits your unit.

STANDS

Stands can be fancy, such as the metal molded ones sold by Rise Gardens, or simple, like the bamboo stakes that Click & Grow offers. The point is to help support plants that can grow too tall or bear fruit and need help supporting that additional weight.

DIY PLANT SUPPORTS

If you don’t want to buy the premade versions, you can always go the DIY route. Things like toilet paper rolls or cut-up pool noodles can help taller, floppy plants like dill! If you have access to a 3D printer, you could print out some plant stands or look online in places like Etsy for some other industrious person who has made some with their own 3D printer.

You don’t have to be fancy when it comes to plant supports. Even a toilet paper roll can help out in a pinch!

Understanding Pollination

Pollination plays into the difficulty of the plants we are trying to grow. As a newbie it is always best to start small and grow your confidence and skills. Outdoors there are wind and insects to help with pollination. Indoors it is all up to us. Fans can help to simulate the wind for self-pollinating plants, but manual pollination is required to mimic insects. For new indoor gardeners, it can be helpful to start with things like lettuce or other leafy greens and herbs. These don’t require pollination and can help to boost your confidence before jumping into self-pollinating but more complex plants like tomatoes and peppers. Plants like melons, squash, and cucumbers should only be tackled later when people are feeling more confident in how to grow food indoors. For that reason I have ordered the types of pollination necessary by difficulty. I have also provided some examples of some great plants to try in each category.

POLLINATION-FREE PLANTS

Not all plants require pollination to get you to a harvest. These are the easiest plants to start with and include herbs and leafy greens. They do require pollination to complete their life cycle, but they have served our purpose well before that. Some great starter plants are:

- Lettuce
- Arugula
- Basil
- Chives
- Dill
- Radish
- Beetroot
- Cauliflower
- Broccoli

SELF-POLLINATING PLANTS

Self-pollinating varieties have both the male and female parts contained within the one flower. This increases the chances that the two portions will come into contact with each other (outdoors from pollinators, wind, or rain). While they do not require manual pollination, you can increase your harvest if you help nature along a little bit.

- Tomatoes
- Peppers
- Peas
- Beans
- Eggplants

PLANTS THAT REQUIRE MANUAL POLLINATION

Plants that require manual pollination have separate male and female flowers. There is very little chance the male pollen will reach the female flower without a pollinator or you stepping in. These include such things as:

- Cucumbers*
- Squash
- Melons
- Gourds

*While most cucumber varieties require manual pollination, parthenocarpic cucumbers do not, and that can make them easier to grow indoors. They produce female only flowers and they tend to be seedless.

Veseys
14038A
Pkg
Cucumber
Mini Munch
Super snackable.
Mini Munch is crisp and delicious with tender skin and a seedless, juicy interior. The fruit are best harvested when 3-4 inches long, just right for a tasty single serving. This variety has long vines with minimal branching which makes it excellent for trellising. The vigorous, parthenocarpic plants are very

If you want to grow cucumbers indoors and want to make your life simpler, choose a parthenocarpic variety that doesn't require pollination.

HOW TO IDENTIFY MALE AND FEMALE FLOWERS

In order to properly pollinate manual-pollination varieties, you need to be able to identify the male vs. female flowers. If you are just moving pollen from a male to a male flower, you won't end up with any fruit! Male flowers tend to appear first, and they have longer stems. In nature, the point of this is to let the pollinators know where the good stuff will be! The female flowers have shorter stems and a little version of the final fruit below the flower. It is much easier to see on huge squash flowers than a small cucumber or melon flower, but it is totally doable. Plus, the cool factor of growing a melon or cucumber that you hand-pollinated indoors in the middle of winter is truly something to brag about.

You can identify female flowers by their shorter stems and a baby version of the fruit right under the flower.

The inside of the female flowers has the stigma, which is connected to the plant's ovary. In this picture, you can see there is some pollen on it, which I applied from the male flower in order to fertilize it.

Male flowers have longer stems and no baby fruit under them. They tend to bloom first. In an outdoor garden, this helps “train” pollinators to come, so that when the female flowers emerge, they are more likely to be pollinated.

In their centers, male flowers have anthers that have the pollen on them.

One of my favorite melons to grow is the charentais melon. It is a type of cantaloupe that, unless you grow it yourself, you won't taste unless you go to France. I even managed to grow one indoors in my AeroGarden Farm over winter one year.

How to Pollinate Your Plants

If you are feeling adventurous and want to attempt some plants that require hand pollination or want to increase the yields of self-pollinating varieties, let's look at how to do it. As with many subjects in this book, pollinating can be simple, or you can level up the process. For plants that require pollination, we'll look at the three main ways you can do this at home.

Sometimes you can do everything right, and the fruit still doesn't get fertilized. You will notice it seems a bit dull, and then it will start to shrivel up.

If things do go right with the fertilization, then the small fruit will start to swell and have a shininess too it.

POLLINATING WITHOUT TOOLS

This is by far the easiest method because you don't need any equipment, just a gentle touch! This method works for selfpollinating varieties, such as tomatoes, peppers, and eggplants. Once the plant has flowers, you want to

grasp the stem (I do it just above the grow deck) and *gently* give the plant a little shake. This helps increase the chance of bringing the male and female parts of each flower into contact with each other. I don't set a schedule for this method; I just give a gentle shake when I pass by the plants.

If you want to keep it simple, you can just gently grasp the stem and give it a gentle shake. This is an easy way to help increase pollination!

POLLINATING WITH AN ELECTRIC TOOTHBRUSH OR AEROGARDEN POLLINATOR

Another method that works for self-pollinating varieties is using the AeroGarden pollinator or an old electric toothbrush (although an electric toothbrush will likely have a more powerful vibration). If you select this method, you want to touch the device against the stem and let the vibration do the work for you. You could also go branch by branch or flower by flower, but it is not necessary. When I was first getting started growing hydroponically, I bought the AeroGarden pollinator, but now I just use the shaking method most of the time.

There is no need to go flower to flower with the pollinator, you can just press it up against the stem and turn it on. The vibrations will help get the pollen moving to increase pollination. If the plant is very large, you may want to do this on multiple areas of the plant.

POLLINATING WITH A PAINTBRUSH OR COTTON SWAB

If you are dealing with plants that need to be manually pollinated, the first two methods won't work because we need to get the pollen from Point A (the male flower) to Point B (the female flower). The best way to do this is with a paintbrush. It doesn't need to be a fancy paintbrush; it just needs to be a soft one (not a kid's one with hard plastic bristles).

This is basically just a paintbrush, but I like that it is short and that the bristles are dense and short. Any paintbrush will do the job just fine, just make sure you choose one with soft bristles that won't damage the flowers.

This method is more time consuming because you will need to go flower to flower. Carefully take the pollen from male flowers and apply it to the female ones.

1 **Take your paintbrush or cotton swab and run it over the center of the male flower to gather some pollen.** You can also remove the whole male flower, carefully peel off the petals, and then use the center of the flower as a “paintbrush.” Be gentle so you don’t knock all the pollen off.

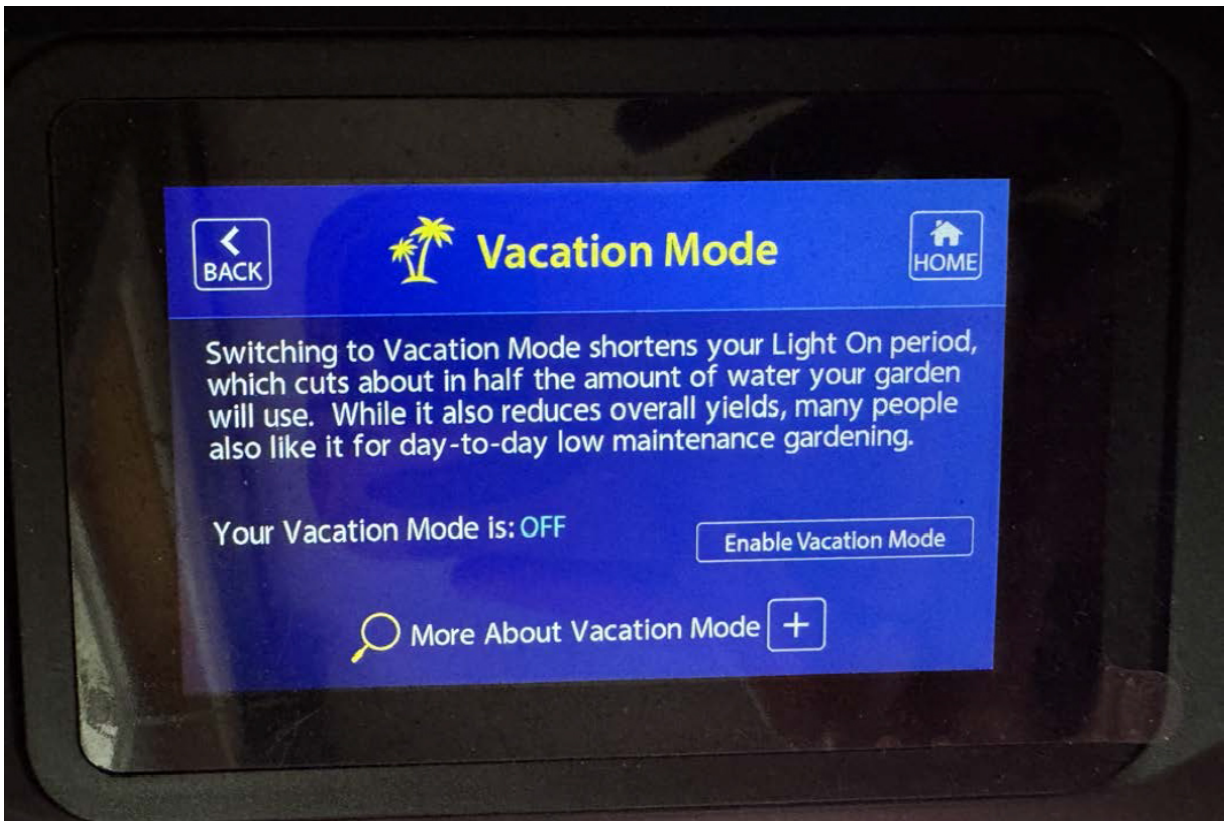
2 **Find a female flower and “paint” the pollen onto the center of it.** Repeat this process multiple times for each female flower.

When You’re Away

At some point in your growing journey, you will need to step away from your plant babies. It could be a vacation, a work trip, or something else. It can be stressful, especially if you have been caring for your plants for a long time. There are people that have had pepper or tomato plants in their systems producing for over two years! Here are some ideas to help protect your plant investments while you are away.

VACATION MODE

Systems like AeroGarden offer a “Vacation Mode” on some of their systems. The concept behind Vacation Mode is that it reduces the length of time the lights are on (by about 50%). This slows down the growth of your plants and causes them to use less water, but it will also lead to reduced yields. As with anything, this is not meant to be a silver bullet and will not sustain your plants if you go on a cruise around the world. It is meant for shorter trips and can help keep your plants going for about two weeks. Just make sure to top off your tank to the “fill here” line before you turn on Vacation Mode and head out.


BACK
Vacation Mode
HOME
Switching to Vacation Mode shortens your Light On period, which cuts about in half the amount of water your garden will use. While it also reduces overall yields, many people also like it for day-to-day low maintenance gardening.
Your Vacation Mode is: OFF
Enable Vacation Mode
More About Vacation Mode

If you are going to be away from your AeroGarden for a week or so and you can’t find a plant sitter, the AeroGarden Vacation Mode is an option on certain models.

BIGGER RESERVOIRS

Another option is to increase the size of the reservoir, so your plants have access to more nutrient solution. AeroGarden has their AeroVoir which allows you to add 1.3 gallons of reserve water/nutrient solution. You could

even add more than one! They feed into the water reservoir via a tube from the AeroVoir through one of the available holes on the grow deck. If you have a Rise Gardens model, you can add a larger tub in the lower cabinet to allow for additional water.

Another easy option is to use a wine bottle or two. Make sure they are well cleaned. Fill them up and invert them through an empty hole, and as the water level drops, the water will be pulled from the wine bottles. This is a great option for systems with a deeper reservoir. Just be careful flipping them over so you don't end up dumping all the water onto the floor!

An AeroGarden AeroVoir is a great option if you are going on vacation, or even just for everyday use, as it increases the length of time before you need to add water. I also love that it gives you a visual reminder of how much water is left.

CHAPTER 11 - CLEANING & MAINTENANCE

Cleaning your system is an important part of the process to ensure healthy plants.

It’s true that a clean system is a healthy system, which in turn means healthier plants. Setting up a cleaning schedule can be helpful, and there is no end of suggestions out on the internet. My planned schedule is a cleaning and full water change once a month and a deep clean every three

months. Will this be my forever schedule? That will depend, as I am a firm believer in test and learn. I plan to try this out for a year and see if any tweaks need to be made. I am also planning to track how I need to reset the nutrients after each cleaning.

It is also important to note that the more systems you have, the more daunting the cleaning can become. This overwhelm has tripped me up in the past as I kept getting more and more systems. Dedicating a day for deep cleaning means you can set yourself up for success, enlist help (or bribe people), and get it all done in a day. This is a big reason why I suggest a deep clean every three months (see here).

Cleaning Tools

When it comes to the tools you will need to clean your system, I have grouped them into five chunks. Within these, I have given you options to consider so that you can build up your own cleaning toolbox.

CONTAINERS FOR SOAKING

To clean your systems, you'll need somewhere to keep all the parts contained while they soak in vinegar or bleach solution. You can use the sink, the bathtub, or another container that's big enough to hold all the parts. Make sure that your container can handle vinegar or bleach. You may also find that you don't want to fill the bathtub with a 1:1 ratio of water and vinegar! I use a dish pan I got from a dollar store.

TOOLS FOR SCRUBBING

The most important thing is to make sure your scrubber of choice is not too abrasive. We don't want to scratch any parts of the system because that just gives algae and other wee beasties new nooks and crannies to hide in. You can use paper towels, a washcloth, or my favorite—a Swedish dishcloth. I don't recommend sponges because they tend to get shredded on some of the pieces in the system.

I like to put all the bits of the system that need cleaning into a bin. You can use a sink or a bucket, whatever works.

You can use a washcloth or a Swedish dishcloth, which is my tool of choice. After you have used them for ages, you can pop them into the composter!

If you haven't seen a Swedish dishcloth before, they are an awesome replacement for paper towels. They are typically made of mostly cellulose and cotton and absorb 15 to 20 times their weight in water. One Swedish dishcloth can replace 17 rolls of paper towels! They are also quick to dry, come in cute patterns, and can go in the top rack of the dishwasher. If that isn't enough to convince you, when they reach the end of their long lifespan, you can throw them in the compost. You can get them relatively easily online. I have one for washing dishes, one for countertops, and one for washing my systems.

It’s always good to protect your lungs and skin, and it’s mandatory if you are cleaning with bleach!

TOOLS TO PROTECT YOU

Because we are dealing with bleach and vinegar for cleaning, you will want to protect your skin by wearing rubber gloves. You don’t want to end up with sore and irritated hands. Check to make sure there are no holes in the gloves before you start. If you are using bleach, you may want to wear a mask as well.

TOOLS FOR CLEANING NOOKS AND CRANNIES

There are a number of common items that are extremely helpful for getting into all the tight spots where nasties can hide. I like to have the following on hand:

Cotton swabs can get into tight spaces and allow you to apply some pressure. That extra pressure allows you to clean properly in a way that you can't with pipe cleaners or a cloth.

A soft-bristled toothbrush is great for getting into perforated pieces of the system as well as bigger nooks and crannies.

Pipe cleaners are my go-to when cleaning the curved grooves inside the AeroGarden grow decks.

A flexible tube cleaner is important if your system has tubes that move the water around. I was never able to properly clean the tubes until I got one, and now it is nonnegotiable for me.

Toothpicks with pointed ends can be helpful for getting out roots in the pump.

Two optional items that you might want to add to your toolbox are a small handheld steamer and a small hand vacuum. The vacuum is great for removing leaves or other items from the grow deck. I go over the whole system with the steamer just to be thorough, but it is great for any hard-to-reach areas.

I find that a pipe cleaner is a great tool for cleaning in the grooves in the AeroGarden grow deck. It is perfect for getting into the nooks and crannies, and you can usually pick up a big bag of them at a dollar store.

Even something as simple as a toothpick can help get pesky roots out of the pump.

This type of steamer is useful for many reasons:

- It is chemical-free and eco-friendly—it's just water heated up until it turns into steam.
- It provides a very deep cleaning.
- It can help remove some (but not all) stains in your system.
- It can get rid of mold and mildew.
- It can kill pests, microbes, bacteria, and viruses.

CLEANING AGENTS

You can’t really clean, especially deep clean, without some kind of cleaning agent. There are a few to choose from, and the choice will also depend on whether you are doing a monthly or deep clean.

Here are the most common cleaning agents:

- Vinegar
- Bleach
- Warm water
- Dish soap (optional)
- Steam (optional, I talk about this more in the next section)

For the monthly clean, I opt for warm water and some steam. For deep cleaning, I use vinegar or bleach (depending on the system size and whether the system in question had any other issues), dish soap, and then steam. Let’s take a look at the differences between vinegar and bleach that will help you make the best decision for you and your cleaning scenario. ***One word of caution: Never, ever mix bleach and vinegar. Mixed together, they create a dangerous chlorine gas, which is toxic.***

Vinegar is my choice when things are going well with my system and no major issues are present. You will want to get the strongest plain white vinegar you can. I use vinegar that has 10% acetic acid vs. normal vinegar’s 5%. You’ll also need to know that we are going to use quite a bit of it. When cleaning with vinegar, you are going to need a 1:1 ratio. That means you need one cup of water to one cup of vinegar (that’s why I don’t recommend filling the bathtub using this method).

Allen's Cleaning Vinegar is my go-to here in Canada because it has a stronger concentration of acetic acid (10%) vs. normal white vinegar (5%).

If you feel that your system needs a deeper clean, especially if you have had a disease in your system, then you may want to do a cleaning with bleach.

Bleach is my choice when there are pest or disease issues, the deep cleaning has been waiting a little too long, or the system is particularly messy. I'll also choose bleach if the system capacity is so big that using vinegar is not really feasible. When cleaning with bleach, you want to add ¼ cup of bleach to every 10 cups of water. You'll also need to let your system dry for 48 hours after using bleach, so make sure you account for that time in your process. Another reason I only choose bleach when I feel it's necessary is because the smell tends to bother me.

Monthly Cleaning vs. Deep Cleaning

In this section, I'll break down for you what I do monthly and what I do for my deep cleaning.

Monthly Cleaning – Lets you get up close and personal with your plants and your system. This is more of a surface-level cleaning and full water change to refresh everything.
Deep Cleaning – This is the full CSI-type investigation. Take everything apart, clean it fully, look for any defects, and do your best to get the system back to a fresh, out-of-the-box level of clean.

IDEAL CLEANING SCHEDULE (SEE HERE)

CLEANING STEP	MONTHLY CLEANING	DEEP (QUARTERLY) CLEANING
Step 1	Yes	Yes
Step 2	Yes - modified	Yes
Step 3	Yes	Yes
Step 4	Yes - modified	Yes
Step 5	No	Yes
Step 6	No	Optional but recommended
Step 7	Yes	Yes
Step 8	Yes	Yes
Step 9	No	Yes
Step 10	No	Yes
Step 11	No	Yes (if using bleach)
Step 12	Yes	Yes
Step 13	Yes	Yes

How to Clean Your System

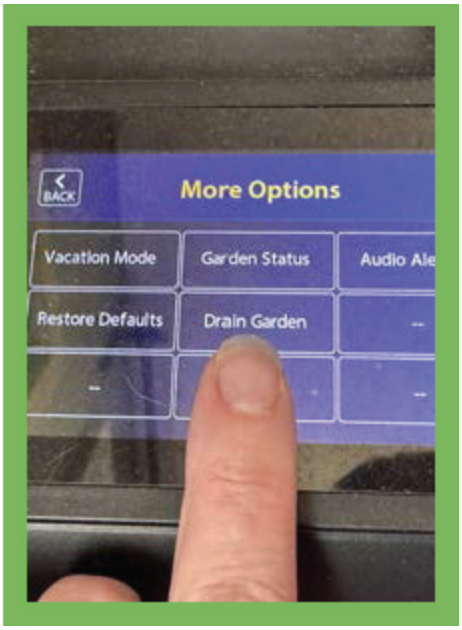
Let’s now go through all the steps that are (or at least should be) involved in cleaning your system. Some steps will apply only if you are doing a deep cleaning (see the chart on here).

1

Turn off the system. Before you do *anything*, please turn off your system. It may seem silly, but remembering to turn off or unplug your system before you start helps protect your pump and keeps everything safe.

2

Remove any plants and debris. If you are doing a monthly cleaning, you can leave your plants in the grow deck. Remove any plant debris and wipe down the grow deck. Set it aside and move to step 3. If you are doing a deep cleaning, take out your plants. This is a great time to determine which ones you want to keep and which ones can head for the compost bin or be transplanted into an outdoor garden, Kratky jar, or a pot with soil. For any that you are planning to put back in the system, take note of their root health and determine if they need a root trim. Also, check your plants for any signs of pests or diseases. Carefully set aside plants you want to keep. Get rid of any leaves, flowers, or anything else left on the grow deck (this is where I often use a hand vacuum).



3

Drain the system. We need to get the old water out, which can be easier said than done, depending on the size of your system. If your system has a large water capacity, carrying it and draining it out all at once can be out of the question! Some systems that have a pump have a reverse or drain function, which allows you to pump the water out via a tube into a bucket. Depending on the size of your grow bowl, you can carry it to the sink to dump out the water, siphon it out with tubing, or scoop it into a bucket a bit at a time and dump that in the sink. Take your time so you don't spill dirty water all over the floor or hurt yourself!

TIP: Setting aside the plants you want to keep can be tricky if they have long roots, since you want to keep the roots clean. If you have a clean bucket or tub and can balance the grow deck above it, that will be helpful. Just be sure to keep the plants safe until you can put them back into the cleaned system. Any plants with pests or diseases should be discarded into the garbage (you don't want to put them in the compost).

4

Disassemble the system. If this is a monthly cleaning, you only need to remove the reservoir so you can empty it. If this is a deep cleaning, you need to take the whole system apart. It can be very helpful to take pictures of everything as you disassemble, so you have something to refer back to when you have to reassemble the system. Note: If you have an AeroGarden (other than the Sprout), it is important to take apart the grow deck. There are clips underneath that you will need to carefully pry apart to open the deck.

5

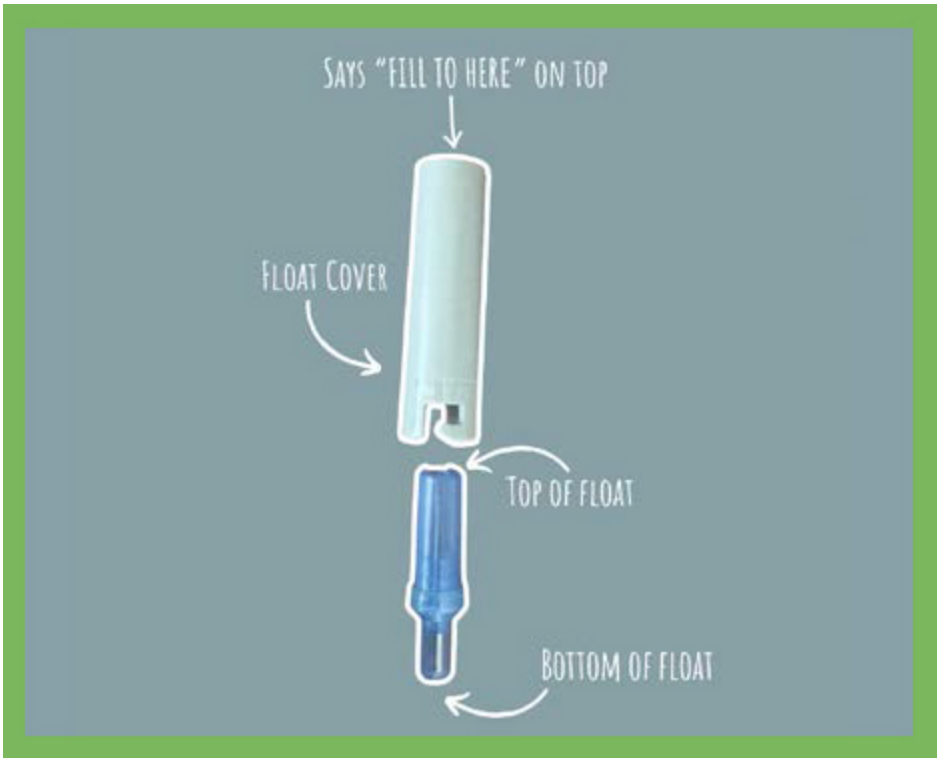
Soak and scrub the pieces. Put warm water and a little bit of dish soap into your cleaning container. You only need a little bit of soap in the warm water because you don't want to risk leaving any residue. Put all the pieces into your cleaning container, grab your cleaning tools, and make sure to get into *all* the nooks and crannies. Take the time to do it properly. This is especially important if you have had any pest or disease issues. You want to make sure they are completely eradicated. When you are done, pour out the soapy water and rinse everything with cold water.

6

Steam clean the system (optional). I use a small handheld steamer for this step. Once I am done cleaning all the parts with soapy water and have rinsed them, I go over the entire system with the steamer. Simply let the steamer come up to temperature and go over all the parts *carefully*. It is hot, and you don't want to scald yourself. You can also steam clean in two parts. Steam now when everything is disassembled and then again after you have reassembled the system (step 8). Make sure you keep the steam far away from any electrical components or digital displays.

7

Inspect all the pieces. Look over all the pieces of your system, making sure everything is clean and nothing is broken or cracked before you reassemble it. If your system uses spray nozzles, test them out before you put everything back together. Pay special attention to your tubing if your system has tubes. I've mentioned before how a flexible tube cleaner was a game changer for me, but at some point, all the cleaning in the world won't get the tubes clean enough. If they become tough, cloudy, and brittle, you probably need to replace them. Make sure you have pictures of how they connected and keep any connectors so that you can reuse them.



8

Reassemble the system. You may want to have your instruction manual handy or refer to the pictures you took when you disassembled it. Once you have it all back together, ensure that the system is still level. A common mistake after cleaning is putting the float back upside down. The picture shows how the float in the Harvest Slim should be put back together. Note: The systems all have different types of floats (or no floats at all), so be sure to check the manual for your specific system when reassembling.

9

Run the system with cleaning solution. Mix your cleaning solution to fill your reservoir using either vinegar or bleach. Remember you need one cup of water to one cup of vinegar. For bleach, you need ¼ cup of bleach to every 10 cups of water. ***Never, ever mix bleach and vinegar. Mixed together, they create a dangerous chlorine gas, which is toxic.*** Once the solution is in your system, plug it in and let the solution run through the system for 30 minutes. This helps make sure any hard-to-reach places are cleaned, such as pumps and tubes. Once the time is up, unplug your system and carefully drain out the cleaning solution.

10

Rinse. This may seem like such a simple step, but it’s very important. Soap or cleaning solution residue can negatively impact your plants, and we don’t want that. Once the cleaning solution is drained, refill the system with clean, plain water and plug it back in. Let the system run with just water for 10 to 15 minutes. This will properly rinse out the pump, tubes, and any tight nooks and crannies to make sure there is no soap or cleaning solution residue left inside. Unplug your system again and empty out all the water.

11 **Leave the system to dry if you used bleach.** If you used vinegar, you can skip this step and move on to step 12. If, however, you used bleach, then this is a very important step. Since bleach can stick around for a while, you will need to leave all your components to dry for 48 hours. This time allows the bleach to fully evaporate, leaving no residue behind. If you have plants waiting to go back into the system, make sure you have them sitting in water for the duration of the 48 hours.

12 **Refill your system and test your water.** Refill your system using the water of your choice. Plug your system back in. Make your nutrient solution and also add anything else you might be using, such as Cal-Mag. Keep in mind that anytime you introduce fresh water and new nutrients into a system, you should make sure everything is within our target ranges. It's the perfect time to check the EC and pH. If you are using a testing meter, make sure it is calibrated properly. As you add anything (pH Up or pH Down, for example), take it slowly and test as you go.

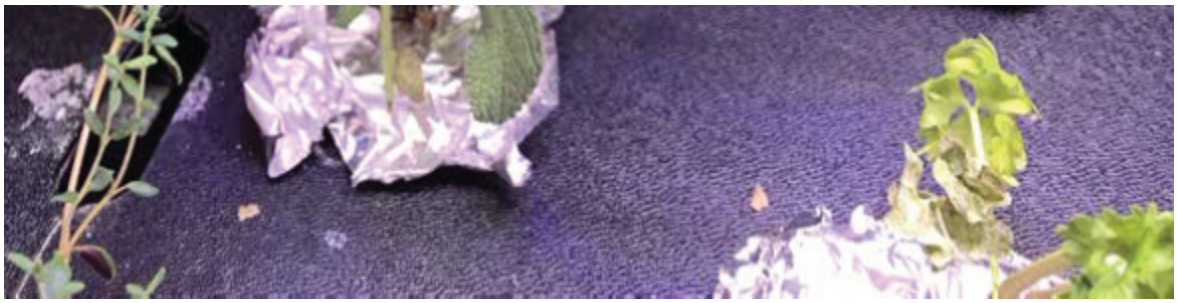
13

Replant. This is always my favorite part and not just because the cleaning part is over! If you are putting grown plants back into your cleaned system, take stock of where they were and where they might better be located. Move them around as necessary. If you are tracking your plant placement in an app, make sure you update the locations. If you are starting from seed, be sure to note where you are putting everything.

CHAPTER 12 - HARVESTING, TRANSPLANTING, AND SUCCESSION PLANTING

This is what it's all about! Now is the time when you get to harvest the bounty that has arisen from all your efforts. There is such a sense of pride and accomplishment that occurs with your first or even your 115th harvest. So, go ahead and take those Instagram-worthy shots and post them with pride. Even after all these years, I still get joy from cooking and being able to say, "and I used [insert awesome thing I grew here] from my indoor garden!" Full bragging rights are achieved when you can say the *entire* dish was made from things you grew yourself.

RISE
RISE



Growing and harvesting your own fresh herbs, like the sage and cilantro shown here, is cost-effective and satisfying.

The raised ridges on a jalapeño are the stretch marks of the pepper world. They can show up if the pepper has had a growth spurt from some extra heat or extra water (in an outdoor garden).

It is good practice to wait until the lettuce is a decent size before you start harvesting from it. You don't want to stress out an immature plant to the point that it won't recover.

How to Know When to Harvest

If you are just getting started growing your own food, you may be wondering when the right time to harvest is. You may wait for the right time to harvest, only to find out you waited too long, and your harvest is past its prime. We've all been there. Here are some guidelines I have created for harvesting foods that are commonly grown hydroponically.

Tomatoes take longer to ripen in a hydroponic garden, and it can honestly seem like they will *never* ripen. Trust me, they will! You can go by the color (just as you would outdoors), unless you are growing a variety like Fat Frog, which is green when ripe. You can also know by feel. If they are rock hard, leave them a bit longer. If they have a bit of give when gently squeezed, go ahead and try one! If you are growing a variety like Fat Frog, obviously you go by feel alone.

Peppers are ready to harvest when they reach the right color (specified for that variety) and also reach the size you want. A great example are jalapeños. We tend to eat them when they are green, but they will ripen all the way to red and be hotter, if left to their own devices. They can also tend to get corking (light brownish raised lines), which is totally normal.

Lettuce is generally ready to harvest when the outer leaves are as big as your hand. You want to make sure you leave enough of the plant to keep growing. Harvesting lettuce also depends on *how* you harvest it, which we'll talk about later on.

Herbs can be harvested sooner than many plants because you don't tend to need a lot of them at a time (unless you are making something like pesto). A good rule of thumb is not to take more than a third of the plant. You always want to make sure the plant will have enough mass and leaves to be able to continue growing without putting it under too much stress.

Cucumbers are ready to harvest when they have the right color, size, and firmness. They should be a nice dark green color (unless you are growing a lemon or white variety), and they should be firm and well sized. Your seed packet should tell you the ideal size to harvest. If left on the vine too long, they will become overripe and start to go yellow, yucky, and bitter. A few I like and their ideal size for harvesting are Mini-me (West Coast Seeds), which should be harvested at 2.5" to 3" (7 to 8 cm), and Dasher II (Rise Gardens), which should be harvested at 3" to 4" (7 to 10cm).

A fresh cucumber, grown indoors hydroponically over the winter, is truly a special thing! As they need so much water to grow properly, I find they take really well to being grown hydroponically.

Green onions can be harvested by size depending on your preference. I like to harvest mine when they are about the width of a pencil or, at most, a Sharpie. The key with green onions isn't so much about *when* to harvest as it is about *how* to harvest, which we will cover in the next section.

How to Harvest

When you're new to something, many tasks can seem overwhelming. My hope is that the information above acts as a guide for when to harvest. Now, let's look at how to harvest some of the common plants.

LETTUCE AND HERBS

Pulling the whole lettuce is definitely a harvesting option, but one that I rarely use. If you pull the whole plant, then there is nothing left to grow!

If you are using the haircut method, make sure you don't take off more than a third to half of the plant. You may see some white liquid—this is a natural plant latex. It is not dangerous and safe to eat.

My go-to way of harvesting is to take the outer leaves. This means I am always taking the older leaves, leaving the newer ones to grow, and I am keeping the size of the plant in check.

There are three main ways to harvest lettuce, other leafy greens, and herbs: the haircut method, harvesting the outer leaves, and harvesting the whole plant.

Harvesting the whole plant: If you are making salad for dinner and only have one lettuce plant, then you may need to resort to this approach. In this case, you are going to cut or twist out the plant from the base. This method provides enough harvest for the meal and frees up a new space to grow something else.

The haircut method: In this approach, you allow to plant to regrow after you have taken your harvest. Hold onto the top of the lettuce or herbs, and cut across in a straight line, making sure to leave at least a third of the plant intact. You want to make sure that you don't harm the crown, which is the growing center of the plant. If the crown is damaged, the plant won't be able to grow back. If you are worried or trying this for the first time, only take the top third to half of the plant. Once you're done, take a second to look and see where the crown is so you will have a better idea for next time.
Harvesting the outer leaves: This one is my favorite! Like the haircut method, it also allows the plant to regrow, but it does less damage to the plant. When you use the haircut method, you are pretty much cutting across all the leaves. As with pruning, any cuts are a potential way for bad things to get in. By harvesting the outer leaves only, you reduce the number of open "wounds," and you remove the older leaves to keep the footprint of the plant smaller.

TOMATOES

The two main categories of tomatoes, determinate and indeterminate, are both harvested the same way. All you need to do when harvesting is grasp the stem in one hand and gently twist the tomato off with the other.

PEPPERS

Peppers are nice and easy to harvest. Simply cut them off leaving about 1" (2.5 cm) of stem on the pepper. I don't like to pull or twist them off because I inevitably end up pulling off part of the stem.

CUCUMBERS

Another simple one to harvest, just snip the cucumber off the vine. It is important not to pull or twist them off, or you can damage the vine. The more you harvest, the more the plant will want to produce flowers and therefore more cucumbers! When you cut them off the vine, aim to leave some of the stem attached to the cucumber, about ½" (1.25 cm) should be good.

GREEN ONIONS

This is where things get really cool! You *could* harvest your green onions by pulling them out of the grow pod, or you could carefully cut it leaving 1"–2" (2.5-5cm) of the white base and let them regrow! People love doing this with ones bought from the grocery store and a cup of water. Doing it in your hydroponic system is the next level! While they won't last forever, you can definitely extend your harvest using this method.

Harvesting the top of the green onions and leaving the bottoms to keep growing keeps the harvest ongoing.

A properly tended system can give you a nice little harvest. These vilma (micro dwarf) tomatoes are going to be the perfect addition to my salad. This variety is a compact determinate plant. The tomatoes are ready in 50–70 days and have a sweet flavor with a little bit of a tang.

On taco night, I love being able to run upstairs to harvest a jalapeño or ten for dinner.

Cucumbers are great for growing hydroponically, as they need a lot of water.

I would be lost without my AeroGarden seedling starting systems for my Sprout and Harvest Slim.

I love that I can start 23 pepper seedlings in the space that normally allows for a maximum of 6! The key is that they are not in the system too long before transitioning to their outdoor life.

Starting Seedlings for Your Outdoor Garden

Beyond using hydroponics to create an indoor garden, you can also use it to start seedlings for your outdoor garden. I love doing this for several reasons. I don’t have to worry about forgetting to water them (it happens), and there is a built-in grow light. Most AeroGarden models have a seed-starting deck available. These are the models I most frequently use, along with the number of seedlings:

- Aerogarden Sprout: 15 seedlings
- AeroGarden Harvest (Classic, 360 + Slim): 23 seedlings
- Aerogarden Bounty: 50 seedlings
- AeroGarden Farm: 85 seedlings (per side)
- Rise Garden: Leverage the 12-hole grow deck insert

It also allows you to take advantage of the fact that things grow faster hydroponically than in soil. This is particularly useful if you get distracted by life and have missed the prime time to start your seedlings for your outdoor garden. I can start 23 pepper seedlings in my AeroGarden Harvest Slim when it is only 10 weeks until my last frost date (ideally you want to start them 12 weeks before). Another benefit is that it cuts down on the space you need, at least in the beginning when they are just getting started. The footprint of one of the tabletop AeroGardens is less than some trays of seedlings in pots!

Transplanting to Soil

We just talked about using hydroponic systems to start your seedlings, which I strongly suggest you try! You can also transplant older plants to soil as well. It is trickier than when they are seedlings, but it is possible. I tend to do this if I want to restart a system with new plants, but I am not ready to let that one plant go. The age of the plant, meaning how long it’s been in a hydroponic environment, as well as the type of plant will play into your chances of success.

Tomatoes are really hardy plants, and they can even keep growing with few or no roots!

Choosing a strong plant is key, and a good root system is a huge part of that strength. Inspect the roots and not just the parts of the plant above the grow deck.

I find it helpful to keep new transplants from a hydroponic to soil environment wetter than usual for the first week. I keep some water in a tray under the pot. Don't leave it too long or you could encounter root rot.

One of the best candidates for transplanting to soil are tomatoes. Honestly, I am pretty sure a tomato plant could survive anything. Many times, I have taken off a sucker, with zero roots, put it in a pot, and watched it thrive two weeks later. Meanwhile, you can just *look* at a cucumber wrong, and it will shrivel and die. If you are going to try this for the first time, try it with a tomato.

The change to soil can be a rude awakening. Suddenly, the plant needs to function in a different way. There is not as much water, and it has to work to draw the nutrients out of the soil, assuming the soil has enough nutrients. Our goal is to ease the transition.

It is important to choose the strongest plant possible. Lift up the plant in question and check out the roots. Are they nice and white, no sign of any sliminess, looking healthy? Once you have established that the roots are healthy, we want to get the plant out with as many roots as possible intact. As carefully as you can, ease the plant out of the system. Start by removing it with the grow basket still attached.

Sometimes, you will need to remove some of the roots in order to get it out of the grow deck. Cut as few as you can to achieve your goal. Next, get

it into a pot with drainage holes that contains a good-quality potting soil. Then, plant it so that the top of the soil is at the same place on the stem where the grow deck was. Pack it in well, so that it stands up, as the roots will need time to learn to anchor the plant in the soil.

Next, we need to put a saucer or some sort of container under the pot and water it well. You want to add more water into the bottom container. Once the soil has absorbed it all, add some more. While we would not normally want to keep a plant in standing water, in this case we do for the first week or two, to ease its transition to a soil environment. After a week, cut back so the water isn't sitting in the container and slowly transition to watering it the way you would a normal potted plant. As it gets established, it is helpful to give it a liquid fertilizer—simply follow the directions on whatever brand you choose. Finally, I like to keep it as close as possible to where it spent most of its life growing. It can benefit from the light spillage from your system. Once it gets more established, you can move it to a new location. The idea is not to change everything about how it grew right away.

Transplanting to Kratky Jars

Kratky jars are a great way to get some plants out of your system without sacrificing them. This could be at cleaning time, when you want to restart your system, or even if you realize you planted too many holes. Sometimes things are just getting too crowded, and it's beyond the point of controlling them through pruning. Whatever the reason, having a Kratky jar ready to take some of the load is always a good idea. Instead of going from growing in a nutrient solution to growing in soil, your plant is going to a like environment. This means less shock to your plant's system. Unfortunately, any time you are transplanting or messing with the world in which your plant is growing, there is a chance you could lose it. But if the other option is the compost heap or leaving things overcrowded, moving to a Kratky jar can be a great choice.

Success Through Succession Planting

Succession planting, by my definition, is planning ahead for future harvest. This applies mostly to single harvest veggies, where you will harvest the whole thing and then have an empty pod. By knowing approximately when your plants will be ready to harvest, you can have seedlings at the right stage to pop into those newly freed-up spaces. If you have a Rise Gardens or other system that comes with a nursery, you can get the seeds started before the other crop is finished and have them ready to move into the main system when you harvest the other plant. That way, you don’t have any empty spaces where you could be growing more food! The Click & Grow 25 is built around this method, as you are adding new plants every week and then harvesting the mature ones as the new ones are growing.

I love to grow beans indoors hydroponically to eat (of course) but also to increase my seed stash.

Saving your own tomato seeds is pretty easy, and I like to grow from seeds I have harvested from my indoor systems. You tend to get stronger plants from seeds harvested from where they are grown.

Seed Saving

If you want to save seeds from your hydroponically grown plants, you will want to let them reach full maturity. Why should you do this when it's so easy to buy seeds? Seeds saved from plants that are habituated to *your* growing environment will tend to grow better. This applies to your outdoor garden too. Let's take the example of a package of seeds from Baker Creek Heirloom Seeds (located in Masfield, Missouri, US) vs. the same variety of seeds from West Coast Seeds (located in Vancouver, British Columbia, Canada). Those are two different environments, different countries, different pest pressures, and different temperatures. The closer the seeds are harvested to where they will be grown, the better.

In the case of seeds grown indoors hydroponically, it's not as much about geographic closeness as about how they were grown. Seeds saved from plants that have grown and thrived in a hydroponic environment will be more likely to thrive themselves. Other seeds will also grow well, but it's great to extend your knowledge and learn to save your own seeds. It can also save you money on seeds and earn you bragging rights!

The easiest plants to save seeds from are tomatoes because we already harvest them when they are ripe, and the seeds will be fully mature. You

can just smear some of the seeds on a paper towel (my mum's favorite way to save seeds), let them dry, and that's pretty much it. You can even store them in the paper towel or transfer them to another container. Just be sure to label them. This method will work for any plant that has the seeds in the flesh, including tomatoes, melons, cucumbers, and peppers.

You can also save pepper seeds, but you have to let the fruit fully mature. Remember that we harvest and eat jalapeños, for example, before they are fully ripe. If you try to save the seeds from one of these peppers, you probably won't get any plants growing because the seeds aren't fully mature. I try to save the seeds when I see that the pepper is starting to shrivel and getting a bit soft. Then, you harvest the fruit, cut it open, and dump the seeds onto a paper towel and let them dry out. We don't want to store seeds before they are fully dry or they can mold. You should always try to save seeds from the strongest plant and choose the best (or prettiest) fruit from which to save the seeds. We are looking to select the genetics that we want to continue growing.

What to Do with Your Harvests

You've probably heard, "Failing to plan is planning to fail" or some iteration of that. It gets to the heart of the point that it is important to have a plan. In hydroponic gardening, the strength of your planning really comes into play once all the fun and excitement of getting started is in the past. You are often drowning in overgrowth or drowning in harvest that you don't know how to use. I want to share some of the things that have helped me to deal with these situations. It is not a one-size-fits-all approach but a matter of picking and choosing which to use at what time.

Prune. Sometimes all you need to do is to clear away some of the visual overwhelm. A good pruning can help. Make sure that you clean your pruners with isopropyl alcohol before you start cutting. Look for branches that encroach on other plants. Aim to create space between the plants. Make a point to stop, step back (actually back away from the unit), and take a

look at how the pruning is going. It is easy to get carried away and cut out too much.

Harvest and freeze. If you don't have a current use for your bounty, you can freeze it to use later, depending on what it is.

Harvest and dehydrate. Another option is to dehydrate any extra harvest, depending on what it is. (I mean, you *can* dehydrate lettuce, but . . .) This as a great option for herbs, peppers, or even green onions. If you don't have a dehydrator, you can dehydrate in an oven or in some air fryers. I even have a special lid for my Instant Pot that lets me dehydrate in it. You can even hang extras to dry, which works well for herbs and peppers.

Harvest and gift. Another option is to share your bounty. Give some fresh herbs to your neighbor, share some cherry tomatoes with your family, or even share some extra lettuce with pets if you have rabbits or some Guinea pigs. It's not usually hard to find someone that would truly appreciate a bounty that you took the time to grow yourself.

Harvest and compost. If you have too much and don't want to (or can't) gift it or freeze it or eat it or dehydrate it, then you can always compost it. You can at least put it to good use making future soil.

My Lomi composter was my favorite purchase of 2024. I make sure to add in anything I prune off my hydroponic units.

CHAPTER 13 - COMMON BEGINNER MISTAKES

This is a picture of my first AeroGarden Harvest. I did what most newbies do and planted all six preseeded pods in all six holes. It ended up being completely overwhelming and way too crowded. Even though I made a mistake, I was able to learn from it and planted in fewer holes in the future.

Issue #1 - Uneven Watering or Dry Pods

Everyone, whether beginners or experienced gardeners, makes mistakes. I have put some common ones in this section along with reasons for them and solutions to them. I have made all of these mistakes myself at one point or another! If you can learn how to avoid these from the beginning, you are going to be off to a great start.

You can use your phone or an old-school level to level your unit, especially if it is an AeroGarden or other drip system!

REASON 1 - NOT LEVELLING THE UNIT

I almost never hear this mentioned, but an uneven unit is the most likely cause of some pods being dry. The water in the AeroGarden units (in all cases but the Sprout) have the water pumped up into the grow deck and then dripped down onto each pod. If the unit is not level, the water won't move evenly through the grow deck, which can leave some pods with no water dripping onto them. Luckily, this is an easy fix! Use an old-school level or even an app like the Measure one that the iPhone offers. Then, it is just a matter of putting something under the system (or the surface that the system is on) until you get it back to being level.

If the pods are too high in the baskets, then they may not be able to wick up the nutrient solution properly. Be sure to press them down (gently) into the baskets.

REASON 2 - NOT PUSHING PODS DOWN

Make sure that the pods in any system are snuggly pressed down into place. If they are sitting too high in the baskets, they may not come into enough contact with the nutrient solution.

Wet pods are visibly darker than dry pods. It is also important to make sure the whole pod is wicking. Old pods may need a longer initial soak to absorb the nutrient solution properly.

REASON 3 - NOT PRESOAKING PODS

This is easier with seedless (grow anything) pods, but you can do it with the preseeded ones as well. The point of presoaking the pods is to make sure they absorb water all the way through. This is even more important if the pods are a little on the older side and may be a bit hydrophobic. If you are using pods without seeds, just pop them into a dish, fill it with water, and leave them to soak until they are fully wet. If the pods have seeds in them, make sure they are propped upright. I use a mug or glass dish. You just want to make sure they won't fall over.

Because the regular Click & Grow pods rely 100% on the wick for access to water, it is important to make sure they are inserted properly.

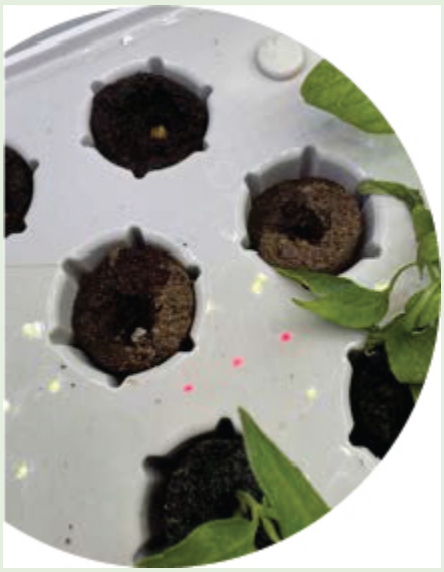
REASON 4 - WICKS NOT INSTALLED PROPERLY

In a system like Click & Grow, the issue could be that the wick is not properly inserted into the cup. You need to make sure that the wick can come into contact with the pod, or it won't be able to do its job properly.

Issue #2 - Poor Germination the seed. It is actually a seed pod that has two seeds inside!

If you struggle with getting cilantro to germinate, gently crack

If seeds don’t germinate, then we don’t get plants, so troubleshooting this issue is key to having a good harvest. As with any of these issues, there can be multiple causes, so let’s take a look at four common ones.



If you haven’t presoaked your pods, pay close attention after planting to make sure the pods are properly wicking up moisture.

REASON #1 - LACK OF MOISTURE

Seeds need moisture to signal that it is time to start growing. The first thing you’ll want to check if your seeds aren’t germinating is the moisture/humidity. A lack of moisture could be a contributing factor to why your seeds are not germinating. This problem is easy to fix. If you

can get the water flowing, then the germination process should be kick-started and the plants should start growing.

If the pods are too high in the baskets, then they may not be able to wick up the nutrient solution properly. Be sure to press them down (gently) into the baskets. The cotyledon on the left had a water droplet from condensation that was touching the dome. The leaf is damaged, but the tomato continued to grow well.

REASON #2 - NOT PUTTING ON DOMES

If the pods are wet, the next thing we need to consider is if there is enough humidity for the seeds. They need moisture, but the humidity must also be high enough. Optimally, you want to aim for 85 to 90% humidity to help seeds germinate, but we don't want to keep it that high once the seeds germinate. Otherwise, we could encounter mold issues. The trick is to keep the humidity domes only until the seeds have germinated. Water that is trapped between the leaves and the domes can act like a magnifying glass and burn your tender cotyledons or leaves.

Sometimes certain seeds are just a little bit slower than their buddies. These guys were planted at the same time as the other peppers, but they are 10x smaller because they started growing a few weeks later.

REASON #3 - NOT WAITING LONG ENOUGH

The seeds of different plants take different lengths of time to germinate. If you are buying preseeded pods, it should state the germination time on the pod label or on the box. You can also refer to the chart on here or do a quick internet search to find a good average. Even so, some seeds just take longer than expected, and that's ok. I like to wait about a month before I give up on seeds. Right now, I have a bunch of pepper seedlings I started in my AeroGarden Harvest Slim at the same time. Most of them are four inches tall, but I just had a few stragglers pop their heads out a few days ago!

REASON #4 - NO SEEDS IN THE POD

Another possibility is that there may not be any seeds in your preseeded pod! Gasp! It could just be that the seeds were jostled out of the pod or the machine that puts the seeds in was having a bad day.

One of my YouTube subscribers who used to work where the pods are filled commented that sometimes the machines have issues, and the seeds don't make it into the pods. AeroGarden has a 100% germination guarantee, so a call to their customer service will have you growing again soon. Click & Grow has a sprouting guarantee as well—you just need to go on their website and fill out a form. Rise Gardens offers a one-year germination guarantee, but you need proof of purchase, and they have some caveats.

If you don't want to go through the hassle to get replacement pods, all is not lost, so don't throw out the pod! You can just treat it like my favorite grow anything pods and pop in your own seed. I personally don't buy the preseeded pods, as I prefer the flexibility of using my own seeds. It opens up so many more options for what you can grow.

Issue #3 - Long and Leggy Plants

Long and leggy plants are not healthy plants. They have been expending excess energy trying to correct an issue so that they can grow. However, long and leggy stems make them weaker and susceptible to a variety of issues. We need to determine the cause and correct it, so they have a chance to get back to growing in a healthy manner.

When the light is too high, it forces the plants to stretch to try and reach it. This leads to leggy seedlings with thin, weak stems, which we don't want.

REASON #1 - GROW LIGHTS ARE TOO FAR

Lack of adequate light is the number one reason for long and leggy plants. You often see it when you are growing seedlings on a windowsill or using a cheap grow light or a regular light. If you are using a store-bought system, the quality of the light is less likely to cause this issue, as long as it is a full-spectrum LED. Since our hydroponic plants will (most likely) spend their whole life cycle under these lights, we need to make sure they have the quality of light they need. The lights also need to be on for long enough. Most systems have a light cycle where the lights are on for 16 hours and off for 8 hours. This covers the needs of most plants you would want to grow indoors.

If your lights are full-spectrum and are on long enough, then the issue is most likely that they are too far away from the growing plants. Your grow lights should be between 4" to 6" (10 to 15cm) above the top of the plants. This means you will have to keep increasing the height as the plants grow. When you are planning your system, it's important to know what you want to grow, to make sure your light is

movable, and to match the maximum grow height of the system with the plants you wish to grow. If the grow light is too high, the plants will stretch to get closer to the light. This makes their stems long (also called leggy). These stems are weaker than the stems on plants grown with light at an optimal height.

How easy it is to fix this issue depends on how old and how leggy your plants are. If they are still young, lowering the light can help correct the issue. If they are too leggy, you may have to start again with a new batch of seeds. Before scrapping them, try lowering the light and see how they respond. Make sure it is not lower than 4" (10cm), or you could cause burning on the leaves if they touch the lights.

REASON #2 - OVERCROWDING

If your system looks like a popular store on a super Black Friday sale, overcrowding could be the issue. Much like reason #1, where the lights are too far away, overcrowding can cause smaller plants to stretch out through the mayhem to try to gain access to the light. Some pruning, moving out some larger plants, or moving the straggler plants can help rectify the issue.

REASON #3 - NOT USING A FAN

An oscillating fan is key when growing indoors. We want to leverage the fan to simulate the air movement that occurs outside. Remember, we want to create a light breeze, not gale force winds! This setup allows the breeze to come and go, giving the plants a bit of stress as it passes by and then a rest until it passes by again. The intermittent breeze strengthens the stems in a way that doesn’t happen without exposure to a breeze.

REASON #4 - TEMPERATURE

Temperature is another factor that can affect multiple things when growing hydroponically. When it comes to leggy plants, a temperature that's too high can be one of the causes. Warmer temperatures can trigger plants into a growth spurt, and they effectively get ahead of themselves in growth and can become leggy. A lot of pH and/or EC testers also give you a temperature reading for your nutrient solution. Having a digital thermometer that you can place on your unit to track the room temperature is a great idea too. Data is everything.

REASON #5 - NITROGEN

Too much of a good thing can quickly become a bad thing. Nitrogen is the main nutrient responsible for leaf and stem growth. Too much nitrogen can definitely cause plants to go leggy. There are other reasons we don't want excess nitrogen, which are discussed in more depth starting on here. Overfeeding is the main way your plants would end up with excess nitrogen, so be careful not to overfeed. Things like lettuce can handle more nitrogen than fruiting plants. Measuring the EC and keeping it in check will help. If the EC is high, adding water will help to dilute the mix and reduce it. Most people don't have the laboratory equipment available to check the exact nitrogen levels, so tracking your pH and EC and using a fertilizer balanced for the type of plant you are trying to grow is key.

Issue #4 - Burnt or Damaged Leaves

Burnt or damaged leaves can indicate a variety of different issues. Let's run through some of the reasons that your leaves may not be looking their best.

Most are easy to fix, so not to worry!

Just like the lights being too high causes problems, so can having the lights too close. You don't want to end up burning your leaves.

REASON #1 - LIGHTS ARE TOO CLOSE

We want to keep the grow lights 4"-6" (10–15cm) above the top of the plants as they are growing. If the leaves get too close to the lights, or worse, actually touch them, then they are easily going to get burnt. It's very helpful to grow plants that are close to the same height, and it is important to pay attention to them as they are growing because they pick up speed as they grow. You may be able to get away with moving the light up every week or two at the start, but later it can be necessary every few days, depending on what you are growing.

REASON #2 - LACK OF AIR CIRCULATION

This is such an easy one to fix, and the fix itself adds so many other benefits. If air isn't circulating, then you can get tip burn, especially with lettuce and leafy greens. By adding a small oscillating fan (set on

low), you quickly increase the amount of air movement. It also helps reduce the temperature around the plants, which can be another reason for crispy tips!

REASON #3 - DOMES LEFT ON TOO LONG

If you see issues on your cotyledons or young leaves and you still have the domes on or have recently taken them off, then that could be the cause. The domes are there to help the seeds germinate by increasing humidity. Once the seeds sprout, the job of the domes is done, and they should be taken off. If they are left on while the plant is growing, it can cause burning on the tender new leaves. The leaves will burn if they touch the dome and there is condensation trapped between the two.

REASON #4 - NUTRIENT BURN

Too much of a good thing can become a bad thing. If you have added too many nutrients and thrown off the ideal EC range, your plants can experience symptoms of nutrient burn. Telltale signs might be leaves that are curling and going brown with edges that are dying. Checking the nutrient solution and adding water to dilute it, putting it back into the ideal range, can help to fix the issue.

REASON #5 - PH IMBALANCE

If the pH is off, it can lead to the plants not being able to absorb nutrients properly. In this situation, there could be leaf damage as a result. It tends to lead to yellowing and curling of the leaves. If you are regularly testing your nutrient solution for pH, this is an easy one to avoid. If you have been neglecting the pH, then a quick test and

adjustments to get it back into the ideal range can alleviate the problem.

REASON #6 - LOW CALCIUM

If you notice that the tips of your leaves are brown and that some are just dying, it can be a sign of calcium deficiency. That can either mean that there is not enough calcium, or that there is enough calcium but your plants can't access it. First, you want to look at the roots to make sure that they are healthy. Roots that are not looking healthy are not going to be able to absorb calcium properly from the nutrient solution. If the roots are looking good, then we need to question if there is enough calcium available in the nutrient solution. The addition of Cal-Mag can help bring things back into balance.

REASON #7 - DISEASE OR PESTS

If you notice that the leaf damage is focused on the tips of the leaves, also consider pests or diseases. Many insects are drawn to the tender new leaf tips, so get out your magnifying glass and have a good look to see if any are lurking among your plants.

QUICK DIAGNOSIS CHART FOR LEAF ISSUES

SYMPTOM	LIKELY CAUSE	CHECK	FIX
Browning tips	Nutrient burn	EC too high	Lower nutrient strength, flush system
Yellow and curling	pH imbalance	pH out of 5.5-6.5	Adjust pH with buffer solution
Crispy edges and curling	Heat stress	High air or root temp	Cool environment, increase airflow
Brown tips and leaf	Calcium	Incomplete uptake	Ensure airflow, oxygen, Cal-

death	deficiency	(despite Ca)	Mag
Sudden tip rot	Disease or pest damage	Mold, insects on or under leaves	Improve hygiene, pest control

Issue #5 - Overcrowding

Burnt or damaged leaves can indicate a variety of different issues. Let's run through some of the reasons that your leaves may not be looking their best. Most are easy to fix, so not to worry!

You may feel like more is better, but overcrowded plants are just a recipe for pests, diseases, and sad plants overall. Give them the space they need to grow, and they will reward you at harvest time.

REASON #1 - PLANTING IN ALL THE HOLES

It seems obvious when you get a system with X number of holes and you get X number of pods that you put said pods in said holes. But this can be where things start to go wrong. Planting in all the holes is a recipe for overcrowding, which can lead to slower-growing plants going leggy as they try to fight through the larger growth for access to

the light. It also reduces the amount of airflow between plants as they are all jammed in against each other. All of these issues can then let pests and diseases in, and we don't want that. If you have planted too many plants, consider moving some to either Kratky jars, to pots, or to an outside garden if the weather allows. Just make sure to cover any holes that are freed up to prevent algae growth.

REASON #2 - NOT PRUNING

You are going to need to sharp pruners cleaned with some isopropyl alcohol. Now, steel your nerves and start clearing the "forest." We want to ensure that you can see between the plants, and we don't want them touching if it can be helped. Leaving space between the plants helps reduce diseases and pests moving from one to another (unless they can fly). It also helps increase the amount of airflow between and around the plants. Just prune slowly, take a step back, and assess how things look. You can always go back and prune more, but you can't stick pieces back on!

Issue #6 - Sick Plants

This issue will have the most explanations because unfortunately, there can be a multitude of reasons why your plants are sickly. We will go through them one by one, and then you can assess which one or ones are the likely cause of your specific scenario.

REASON #1 - NOT PRUNING/OVERCROWDING

Too many plants or plants that are too full in too little space leads to reduced airflow as well as competition for light and nutrients. This can

stress and weaken your plants. This situation can be made worse by not using an oscillating fan. The good news is it's easily fixed by pruning your plants and assessing how many belong in the space. The right number of plants depends on both the number and type of plants you have in the unit. Remove plants that are past their prime, prune the ones that will remain, and rehome any plants you can to pots, Kratky jars, or outdoor gardens.

REASON #2 - NOT CHECKING FOR PESTS AND DISEASES

You need to really look at your plants regularly. I recommend checking your plants weekly. Daily checks might be too overwhelming, especially for new growers, but if you prefer that, go for it! I am always amazed how quickly things can go from "Things are growing great" to "Oh, no, what happened?" Any time I find myself in this situation it is because I let life get in the way or, if I am being truthful, I just got lazy. You need to check for visible pests, and sticky traps are great for this (see here). Also, you need to be looking for signs of damage to the leaves. It is so important to make sure you are paying attention to the plants themselves as well as their environment.

REASON #3 - NOT CHECKING PH/EC REGULARLY (OR AT ALL)

You can make this as simple or as complex as you want, but you should be checking your water pH and EC. If either is too high or too low, it can weaken plants and make them more susceptible to diseases and pests. Just because nutrients say they are pH buffered doesn't mean you don't need to check the pH of your nutrient solution. EC and pH levels can change over time based on a variety of different factors.

It only takes a few minutes once a week to quickly check both the pH and EC levels.

REASON #4 - POOR OXYGENATION IN THE ROOT ZONE

This is a bigger issue in Kratky jars or systems without pumps (I'm looking at you, Click & Grow), but stagnant water is a recipe for bad things to happen. We don't want our plant roots to suffocate and then start rotting. If you are growing in Kratky jars, make sure there is an air space at the top of the jar, so roots have access to air. In other systems, it can be helpful to add a pump. If you already have a pump and you are still encountering issues, adding an air stone can make a big difference.

REASON #5 - NEGLECTING YOUR SYSTEM + EQUIPMENT HYGIENE

I make no attempt to hide the fact that I *hate* cleaning my hydroponic systems, but I still do it. A dirty system is a system that invites pests and diseases in. You can't just clean the grow bowl either. If your system has tubes or grow decks that come apart, then you need to make sure those are cleaned regularly. Pick up any fallen leaves, prune off older ones, switch out old sticky traps, and generally keep things neat and tidy. Some people clean their systems every one to two weeks, but aim to at least do it once a month. It is worth the effort to make your system less appealing to pests and diseases.

Issue #7 - Overwhelm

This is probably one of the most common issues that new hydroponic (and outdoor) gardeners face. New things can quickly become overwhelming just because they are new. Have you heard the saying about how to eat an elephant (figuratively, of course)? Well, you do it one bite at a time. It may take a long time, but it is possible. And that, my friends, is how we approach new things—one step at a time, not trying to take on too much or do everything at once. Small and consistent steps will always lead to progress. Slow progress is way better than getting overwhelmed, giving up, or making no progress at all.

REASON #1 - NOT GROWING WHAT YOU EAT

If you grow things that you don't eat, don't like, or don't know how to use, you can be setting yourself up for failure. Even if the growing part is successful, having a harvest of food you are not going to eat or don't know how to prepare can lead to you feeling overwhelmed. Now, it is always a good idea to try new things, but first and foremost, you need to grow what you will use.

REASON #2 - PLANTING TOO MUCH

This issue is often a combination of packaging paired with excitement. You buy a system that has X holes, and the company usually gives you X number of pods. Naturally, you want to put the provided number of pods in the equally provided number of holes, and you're excited about your new indoor growing adventure! This can be where the problems start. You take on too much too soon, and that can quickly shift to overwhelm when the plants start getting bigger. When starting anything new, it is always a good idea to start small with a simple system, master the basics, and expand later.

REASON #3 - STARTING TOO COMPLICATED

If this is new to you, keep it simple at the beginning! There will be time for growing tomatoes, peppers, and other more complicated plants later. Keep the system simple, and maybe save the DIY build for later if this is your first time. Focus on easy-to-grow hydroponic plants like lettuce and leafy greens. As a bonus, they grow really fast, so you can get multiple growing cycles under your belt before trying out some of the more complicated plants. It is always a good idea to get some wins and learning under your belt before you jump in with both feet.

REASON #4 - STARTING WITHOUT A PLAN

I love a good plan. Truly, before starting anything new, it is always good to sit down and think through everything. Do this before you even buy the system! Know what you want to accomplish, what you want to grow, and how you are going to use it. Do the plants you want to grow have similar pH and EC needs? Are they similar in height? How much space are they going to need once they are fully grown?

It is also important to plan for your failures. Yes, you will fail, and that is perfectly ok. I would argue it’s a necessary part of growing in anything. I have always learned the most from my failures. Pretending you won’t have any failures will impede your growing success, so build that failure into your plan. If you kill a plant, how will you handle that? What will you do if diseases or pests take over your system? What will you do if things start to get too crowded? As an added bonus, once you start listing out all possible failures, it opens you up to planning for them not to happen.

An easy way to set yourself up for success is to start with just a few small plants. Lettuce and/or herbs are great ways to start. They are less complicated than fruiting plants, and most people already use them in the kitchen. Above all, do not write yourself off as an indoor gardener

after one, two, or even 10 mistakes! Mistakes happen at all stages of a journey. I have been growing indoors for over 10 years, and I *still* make mistakes. Don’t give up, take notes, and use the data from any failures to grow as a gardener and to determine where things might have gone awry.

CHAPTER 14 - OTHER COMMON PROBLEMS

My sphynx cat Lion-o never met a plant he didn't want to eat. If you have pets, it is a good idea to locate your system so that your plants won't fall prey to little mouths! If your pets don't tend to eat your plants, it is still good to be cautious and make sure that what you are growing is not poisonous to them. I avoid these issues by keeping my units in my grow room. The door is shut at all times.

I hope you never need this chapter, but it's probable that you will because growing indoors hydroponically doesn't mean your plants can't have pests or diseases. The pests, diseases, and other issues we have to deal with when growing indoors can differ from what we experience when growing outdoors. While these issues are less likely to rear their ugly heads indoors, they do tend to be much more impactful when they do. This is especially true when it comes to pests because you can't really leverage their natural predators indoors, unless you don't mind a

house full of ladybugs, lacewings, and my personal favorite, praying mantises. Let’s delve into this topic with a mindset to plan for the worst and hope for the best.

Pests You May Encounter

If there is one thing you don’t want to deal with, it is an infestation of creepy crawlies in your home. Unfortunately, it can happen, so it is best to know what you could be facing and put a strong defense in place. Also have your offense ready to go if needed! You may even be wondering how such things occur. Pests can come in through an open door, on your clothes, through a window, on your pets, on grow sponges, and even on that lovely new houseplant you just brought home.

Regardless of how they get in, it is what you do that will save the day. On the following pages, we will go over some of the main offenders and how you can tackle them if they show up at your place. The key with pest management is prevention and early detection. We need to quarantine any new plants coming into the house and pay close attention to our plant babies. It is easier to deal with pests when they first show up rather than when you have a full-fledged infestation.

You can see the little thrips and the damage they have done to my pepper leaf here. These little demons plagued my grow room for almost two years before I finally got them under control.

THRIPS

Thrips are hell for me. They reigned over my life and my grow room for over a year. Every time I thought I had emerged victorious, my plants started to grow and show damage again. Truly, from failures we can learn the most. I dug into how to get rid of them and tried a whole bunch of different combinations of methods. Now thrips don't dare show their little heads near me! As a cautionary tale, let me tell you how they even got into my house, because it was 100% my own fault.

I was in a seed exchange, and I got some beans I had been trying to get my hands on. We had had a few mild days in a row, but it was still January, so I didn't have any potting soil on hand. I figured I could run out, get some soil from one of my pots, and start these seeds. And so I did, and so it started. As the beans grew, I saw some little things flying around but didn't think much of it. I had put the beans near my Personal Rise Garden so they could benefit from the grow light. Then, I decided to move the Rise Gardens back upstairs into my grow room (I'm sure you can see where this is going). Suddenly, the little things, which were thrips, were now feasting and breeding in my grow room in *all* my systems! I had never dealt with them before, so I didn't know where they were until I started taking stock of the damage and looking for an answer!

Aside from my tale of woe, let's take a look at this wee beastie. There are over 7,000 species of thrips, and they can serve as conduit for over 20 different plant viruses. Their bodies are cigar shaped, and most are tiny—about 0.04" (1 mm) in size. One thing working in our favor is that they don't fly very well. They like to feast on the tender parts of plants, such as new leaves, buds, and flowers. They can reach adult stage in one to two weeks and can live for 45 days, with females laying up to 100 eggs at a time!

Conditions they love: Thrips are most happy when their environment is warm and dry.

Signs you have thrips: Thrips are tiny, so you probably won't see them as a first sign. Look for indentations, discoloration, or pale-colored patches on the leaves that show where they have been feeding. The leaves can also be misshapen, or you may notice their excrement (frass) that looks like dark spots on the leaves.

Where to look for them: Thrips are particularly fond of new plant bits, so look at new leaves, new flowers, or new buds. The like the young and tender growth, so keep an eye on these parts for them.

Aphids are the kings of blending in. Often, it is their cast-off skins that people first notice.

How they damage plants: These guys are among the sap-sucking crew. They pierce the cells of the plant and then suck out all the nutrients. This can lead to plants being stunted, leaves being damaged, and plants being weakened. In the worst-case scenario, they can kill a plant.

APHIDS

I have always struggled with aphids in my outdoor garden more than my indoor garden. If there is one thing I know, it is that when you see one aphid, there will soon be a bazillion more! This is not a pest with which you want to use a wait-and-see approach. These small, soft-bodied pests love nothing more than sucking the sap from your plants. They can be a variety of different colors such as green, yellow, or black. They reproduce quickly and asexually, so just one aphid can set off an infestation in a relatively short period of time.

Conditions they love: Aphids like to be warm and dry, with a relatively low humidity.

Signs you have aphids: They are big enough to spot, but the green ones can really blend in. You may see weird whitish bits below or on your plants. Those bits can be their husks that they have shed as they grow. Your plants could also feel a bit sticky, and this comes from the honeydew that aphids excrete. (Honeydew is the reason that ants love them and “farm” them in an outside garden.) The leaves of your plants may also appear to be wilted, stunted, or yellow. Some leaves may be curled or malformed.

Where to look for them: Aphids are drawn to the soft, new bits of your plants. I assume it's because the parts are easier to pierce. You will often find them on any new growth, such as young leaves, flower buds, and soft, tender shoots.

Of all the pests, fungus gnats are the ones I have personally run into the most. Often, you see them flying around the room more than you see them on the plants.

These little guys are creepy if you see them pop their heads above the growing medium.

How they damage plants: There are a few ways that aphids can hurt plants. First and foremost, they pierce the plant and suck out the sap. They can also transmit plant diseases, and the honeydew they excrete can cause sooty mold on your plants.

FUNGUS GNATS

Of all the pests on this list, this is the one I have tackled more times than any other. Fungus gnats are tiny, dark, and not known for their flying ability. They always look to me like they had a few drinks before they set out on a flying adventure. The females can lay up to 200 eggs, so they reproduce very quickly, and their life cycle can be completed in as little as two weeks. Things with fungus can quickly get out of hand. They lay eggs in the top layer of growing substrate, so anything you can do to block their ability to get into contact with it can help keep these guys at bay. I sometimes sprinkle vermiculite on tsurface of my Click & Grow pods since I don't have to worry about it clogging anything because it stays in the grow cup. For AeroGarden or Rise Gardens, I use the stickers and keep the foil on, respectively.

Conditions they love: Fungus gnats love it when their environment is humid and moist, especially when there is an accumulation of organic matter for them to feed on. They want this environment for laying their eggs, so that the larva can hatch and feast upon damp organic matter and plant roots. If there is one thing that fungus gnats love, it is moist, organic-rich growing mediums, which is why we encounter them so often when growing hydroponically.

Signs you have fungus gnats: These are the one pest that you are likely to see, which is nice for a change. Outside of seeing them on their drunken flights, you may notice that your plant leaves are turning a bit yellow and wilting. The plants themselves can also be a bit stunted, with mold forming on the surface of the growing medium. This is thanks to the decaying organic matter from the larva feeding.

Where to look for them: Look *around* the room in the air for the adults, and look *down* at the growing medium and roots for the larva. You can also sometimes see the adults flying around the base of the plants, scoping out places to lay eggs. The adults look kind of like fruit flies (not up close but in size), and the larva are gross, little white wormy-looking things.

How they damage plants: It is the larva that end up doing most of the damage. The stunting, wilting, and yellowing leaves is usually from the larva feeding on the root hairs and organic matter. This damages the roots and weakens the plants, which in turn, makes them more susceptible to other diseases.

SPIDER MITES

These little pests can easily go unnoticed until there is a full-blown infestation in progress. They are so tiny, typically less than 0.04" (1 mm) in size. Spider mites can be a variety of colors from red to yellow or green. They are not true insects and belong to the arachnid family. They spin webs, and they have a very short reproductive cycle. Under optimal conditions, females can hatch in three days, reach sexual maturity in five, and complete their whole life cycle in two weeks. The female can then lay up to 20 eggs a day and up to 100 during her lifetime. They can spread from plant to plant by hopping on a breeze, on you, or on the tools you are using. I have found them primarily on my strawberries and my lemon tree that I keep in my grow room.

While they are hard to spot, I snapped a picture of this spider mite on one of my peppers. They are more often discovered when they reach the web stage, once they are well established.

If you see their webbing, then they haven't just set up shop, they have built a mall! Because they are so small, this might unfortunately be your first indication that something is wrong.

Conditions they love: Spider mites like an environment that is dry (even dusty) with low humidity and high heat. They thrive in hot and dry conditions and are happiest when the temperature is around 80°F (27°C).

Signs you have spider mites: These are some of the hardest pests to spot until they are well established, with plans to take over the world or at least my hydroponic system! The main thing you are likely to notice is the webbing they create. Another is tiny speckling on the leaves, which is where they have been feeding. There may also be some discoloration of the leaves, with some yellowing and curling on the edges. Sometimes you'll see early leaf drop, if enough of them are feeding and affecting the plant's vascular system.

Where to look for them: Spider mites love young and tender growth, so they tend to target new leaves, flowers, and buds. They can most often be found living on the underside of plant leaves—so they are microscopic and live *under* the leaves, which is why they can get out of control before you notice! If you think you have them, put a white piece of paper under your plant and give it a gentle shake. The mites should be visible on the paper.

How they damage plants: Spider mites also pierce the plant and suck out the sap. This behavior can lead to leaves that are damaged and yellow. The plants can also be stunted and weak, with reduced yields. If the infestation is bad enough, then the plant can die.

WHITEFLY

This is one of the two pests I haven't yet had to tangle with personally, but I am sure it is only a matter of time. Whiteflies are another type of sap-sucking insect. They can leave your plants stunted, yellow, and even wilting. They are closely related to both aphids and mealybugs, yet they look very different. Whiteflies are almost moth-like in appearance, and they are tiny and white. They make their way into your home through open windows or doors or on new plants or anything brought inside from your garden. That is one of the reasons I have separate indoor and outdoor tools. Whiteflies reproduce quickly, with females laying up to 400 eggs, and the eggs can hatch in less than two weeks.

Conditions they love: Whiteflies like it hot, between 70 and 85°F (21 and 29°C), and dry. They like it even more if you have been neglecting pruning and your plants are overcrowded.

Signs you have whiteflies: If your plants are stunted, wilting, or yellowing, then you could have whiteflies. Other signs are sticky honeydew on leaves (same as with mealybugs and aphids) and dark, sooty mold growing on the honeydew.

These look like itty-bitty pure white moths. They like to hang out under the leaves, so it can be hard to spot them even if they are completely white.

Where to look for them: These pests like to hang out under the leaves, which can mean they get out of hand before you even know they are there. They are attracted to young, new growth. While they are hanging out under the leaves, they are laying loads of eggs and also feeding. You may see them flying around your

plants and systems. **How they damage plants:** Their sap sucking weakens plants, but they can also transmit plant viruses while they are feeding. The sooty mold that can grow on the honeydew is also bad for plants.

MEALYBUGS

I luckily haven't had to tangle with mealybugs yet. They are small, soft-bodied insects that are covered in a white, waxy coating. They are another sap-sucking insect. They can hitchhike into your home on new plants, on tools, on clothing, or even through air currents in indoor spaces. The females can lay 100–600 eggs in cotton-like masses often hidden under the leaves. These eggs hatch within one to three weeks, depending on the temperature and humidity. The females don't fly, but the males do. Many varieties of mealybugs can reproduce without mating.
Conditions they love: Mealybugs will thrive in warm and humid environments.
Signs you have mealybugs: If you notice white, fluffy clusters on either the stems, leaves, and/or roots, there is a good chance you have mealybugs. Another sign is the damage from their sap-sucking, such as stunted growth, yellowing, or deformed leaves. They also excrete honeydew, which can lead to stickiness or black sooty mold. In an outdoor garden, you may notice the presence of ants because they are drawn to the honeydew that mealybugs produce.
Where to look for them: Mealybugs often hide in clusters in the space where the leaf attaches to the main stem of the plant (also known as the leaf axils), under leaves, near new growth, and around plant roots (when growing in a hydroponic system). Mealybugs that get into the roots can be one of the worst for a hydroponic environment. They are easily missed, and by attaching to the roots, they can have a huge impact on the nutrient uptake of the plants. This is a great reason to always check on your root health!
How they damage plants: Their sap-sucking leaves plants weakened, which makes them more susceptible to diseases. The honeydew they create can also attract mold and other pests.

How to Deal with Pests

Now that we have learned all about the pests you may encounter on your hydroponic journey, let's learn what we can do to keep our indoor gardens safe. Luckily, there are a number of choices. I have grouped them into three areas: prevention, detection, and remediation. Obviously, it is best if we never allow

pests to take hold, which is why prevention is key. That said, no matter how diligent you are and all the preventative measures you take, bad things can still happen. This is where detection comes in—the sooner we notice any pests and can take action, the better the chances for our plants. When we have found them, we need to deal with them, which brings us to the last step, remediation.

To me, mealybugs look like a cross between a centipede (with all the legs) and what I call a "woodsie" (you might know them as woodlice, pill bugs, or rolly pollies) in a fuzzy white jacket.

Sticky traps are one of the most effective tools against adult fungus gnats. They can catch hundreds of them!

PREVENTION

Not ever having to deal with pests would be the best-case scenario, so let's look at some things you can do to stack the cards in your (and your plants') favor! Of course, you could do all of these things and still run into pest issues; however, if you don't do them, it will increase the chances that you will run into issues. Some of these options not only help with pest issues but also keep other issues at bay.

The first thing you need to do is maintain a clean system. A dirty, messy system is inviting pests and diseases to take up residence. Keep in mind that some conditions may favor one type of pest and repel another. Here are some practices to keep in mind:

- Inspect new plants coming into your home and quarantine them for one to two weeks.
- Keep your systems and surrounding areas clean. Be sure to remove any fallen plant debris.
- Maintain good air circulation through proper pruning and use of an oscillating fan.
- Inspect your plant roots to ensure your plants are healthy and able to better resist pests.
- Depending on the pest you are facing, you may need to increase or decrease the humidity around your system.
- Maintain a stable and cool temperature. You don't want your hydroponic system getting too hot.

DETECTION

For so many reasons, it is key to look at your plants—really look at them and inspect them. You can take pictures, which are a great resource for tracking how things are growing and how things are changing. Pictures are also good for zooming in to see if anything is going on. You could go old-school and arm yourself with a magnifying glass. Flip over a leaf or two because so many pests hide out under leaves before you start to see their presence on top. It is important to never discount just one fly or just one bug. If you see anything, take action! You would be shocked how quickly things can escalate.

I have found yellow sticky traps to be helpful in acting as an early warning system. Just a word of caution, if you have long hair, make sure it is out of the way. I had one unfortunate incident with loose hair and a sticky trap! These traps are great because you can just hang them up, and they take care of the rest. Keep an eye on them, so you can react as soon as you see anything on them!

Don’t forget to check your roots too. They are a great indication of the health of your plants—nice, white, smooth, and slime-free roots are what we want. Check roots for any signs of damage from larva as well.

REMEDIATION

The best time to tackle an issue was when it started, and the second-best time is as soon as you see it. Don’t wait, act now (as the infomercials say). Time is of the essence because we want to reduce the damage and also because all these pests reproduce at such a rapid rate. There are many things that you can use to help combat a pest issue. We will look at the tools you should have in your toolbox and break down what tool you want to use when. Knowing the right remediation strategy or strategies to use with the specific pest you are dealing with is key to winning the battle. One fun strategy that I want to experiment with is having carnivorous plants in my grow room.

Tools for Dealing with Pests

Now, let’s take a look at some of the things you can add to your tool kit. At the end of the section, I have included a chart that highlights which tools are effective against which pests.

OPTION 1 - STICKY TRAPS

These are my go-to! I have them set up all the time because they are a great early warning system. If I have a big issue, then I just add more. They are great for reducing the adult pest population.

Yellow sticky traps are my go-to. They easy to use; you just set them up and forget them. As long as you set them up right from the start, they can let you know at the first signs of trouble! There are also blue sticky traps sold specifically for dealing with thrips, but I prefer the yellow traps, even for thrips.

How it works: This one is pretty straightforward; pests walk or fly onto the sticky traps and get stuck. Unable to get off, they die.

How to use it: All you have to do is to remove the protective coating, watch out for loose hair (I always put mine in a bun), and then hang it up. It’s such an easy, visual warning system!

I like to hang one large sheet on each level of my Rise Garden or one per side on my AeroGarden Farm.

For smaller units, I prefer these small sticky traps that are meant to be used for potted plants.

OPTION 2 - INSECTICIDAL SOAP

An easily accessible option to keep on hand is insecticidal soap.

Insecticidal soap is made from potassium salts of fatty acids. It is a natural and lowtoxicity option. In order to be effective, it does need to come in direct contact with the pests in question.

How it works: Insecticidal soap can disrupt the soft, protective outer coating that some insects have and cause dehydration (and death) through water loss from their skin. The soap can also damage their cell membranes, causing their internal fluids to leak out, so they dehydrate. Finally, it can suffocate them by blocking their breathing pores in much the same way as neem oil.

How to use it: The thing I love about this option, or at least the ones I have used, is that it is point and spray. Yes, it comes ready to use in a handy spray bottle.

OPTION 3 - NEMATODES

Nematodes are itty-bitty worm-like creatures. There are many kinds (over 1 million), and I use the ones that target pests like fungus gnats and thrips.

Steinernema feltiae (beneficial nematodes) is a great option. I use NemaKnights™ brand, but whatever you use, just make sure you get a variety that works to control fungus gnats and thrips (they are other types). These nematodes are tiny roundworms that love to feast upon specific pests, such as fungus gnat larvae and thrips pupae.

How it works: These little guys are babies themselves when applied. They head out on a mission in your hydroponic system, hunting down pest babies and entering the host bodies through any openings. Once inside, they start releasing symbiotic bacteria that multiply and kill the host. The juvenile nematodes then feast on these dying host juices and mature, and the cycle begins again.

How to use it: Another easy one to use! With the brand I use (shown in the picture), all you do is shake out these little clear-ish balls into the nutrient solution, and you're done. It's an easy precautionary measure to prevent potential problems.

OPTION 4 - *BACILLUS THURINGIENSIS SUBSP. ISRAELENSIS*

I love the simplicity of throwing one of these mosquito dunks into my reservoir and letting it do its thing to keep my plants safe.

Often referred to as just Bt, this naturally occurring soil bacterium is both deadly to many of the pests and harmless to humans and pets. There are different strains that are used to target different pests. Luckily, *Bacillus thuringiensis* subsp. *israelensis* (Bti) is the perfect weapon against many of the pests we encounter indoors when growing hydroponically.

How it works: Bti acts on pests' gut lining, disrupting it, which causes pests to stop feeding. They then die off within a few days.

How to use it: This can be applied as a spray, but I find the easiest way to leverage this powerful soil bacterium indoors is by adding Mosquito Dunks or Mosquito Bits into the nutrient reservoir of my systems.

OPTION 5 - HORTICULTURAL OIL

It is always important to follow the instructions on the particular oil you have bought. They typically need to be diluted to a specific strength to work properly.

Horticultural oil is made from either refined petroleum (mineral oil) or plant-based oils (vegetable oil). It can work against pests and plant diseases, and it's great to have a product that works on more than one issue. It is biodegradable and has low toxicity for both humans and pets. This option requires more care when used in a hydroponic setup as opposed to an outside garden. Make sure you choose one that is clearly labeled as safe for edible plants.

How it works: Horticultural oils kill pests in three main ways. First, it smothers them because the thin, oily coating it leaves on their bodies clogs the tiny holes they use to breathe (spiracles). Second, it disrupts both their ability to move and to eat because it jams up their joints or blocks their sensors. Lastly, it coats both larva and eggs, disrupting development, stopping hatching, and stopping them from accessing oxygen.

How to use it: Use a light touch when spraying on the plants. You do not want to drench them, and *you definitely do not want to get this in your hydroponic reservoir.* If you use too much, the horticultural oil can inhibit the plant leaves' ability to exchange gas. It's also better applied when the lights are off, so that you don't run the risk of burning your plant leaves. When spraying, make sure to target plant leaves, both top and bottom, and do your best to avoid spraying it onto your growing medium. You may also want to do a spot test on each type of plant to make sure they are not susceptible to leaf damage from it. Because each oil is different, follow the label directions when mixing (if necessary) as well as their recommendations for how often to reapply.

OPTION 6 - NEEM OIL

Neem oil is probably the most popular of the horticultural oil options out there—just be careful to only use it indoors and with the lights off. My personal favorite is made in Canada by Kelpy.

Neem oil is a type of horticultural oil, but given its popularity, I felt it deserved its own section. It is produced by pressing it out of the seeds (and fruits) of the neem tree *(Azadirachta indica)*. It packs a punch when it comes to keeping bugs at bay and is effective against all the main ones we encounter when growing indoors hydroponically. It is both a natural pesticide and a fungicide. You have to be a bit more careful when using neem hydroponically as opposed to in soil. Make sure you protect the plant roots from exposure to the oil. It is also one that you should apply with the lights off, so that you don't burn your plant leaves. In case you're thinking about using it outdoors, it's important to note that while it is a powerful weapon against pests, it can also harm beneficial insects outdoors. I only use neem oil indoors.

How it works: Neem oil is powerful and has more than one way that it harms pests. It interferes with pests' hormone systems, which can prevent them from molting and affect their growth and reproduction. It also causes a smell and a taste that some pests prefer to avoid. If the pest in question is soft-bodied, the neem oil can clog the pores they use to breathe, smothering them. It can also hamper the development of both eggs and larva.

How to use it: One of the easiest ways to use it is to make a follicular (leaf) spray.

1. Dilute 1 teaspoon of neem oil into 1 quart (1 liter) of water.

2. Add a few drops of Castile soap (like Dr. Bronner's) or some fragrance-free dish soap. You need the soap to act as an emulsifier. Neem oil (like other oils) is hydrophobic, which is why oil stays on top of water. The soap helps break down the oil into tiny droplets that allow the neem oil and water to mix. It also helps the neem oil adhere to the plant leaves so it can do its job.
3. Shake well to make sure everything is mixed.
4. Spray the plant leaves, especially on the underside where pests can hide.
5. Repeat every 1–2 weeks.

OPTION 7 - PURECROP1

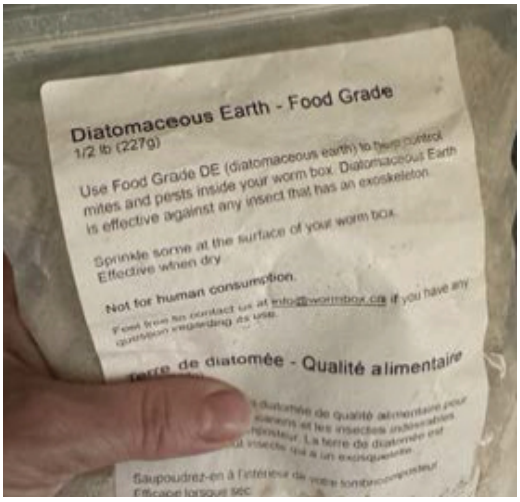
This is a powerhouse and go-to when I have any issues. It is not cheap, but I would rather know the issue will be eliminated than having problems spread.

This specific product was a game changer for me when I was in the midst of a thrips infestation. It is considered a horticultural oil alternative because it is different from traditional petroleum-based horticultural oils. It is made with food-grade plant oils and corn-derived glycerin. This means it is both organic and biodegradable. The nano-sized micelles that PureCrop1 contains are even more effective at getting into pests (and fungal spores). As an added benefit, it doesn't leave any oily residue on plants, and it is a biostimulant, which means it helps increase the overall health of your plants!

How it works: When used to combat pests, it dissolves their exoskeletons and causes them to dehydrate. It also interferes with digestive enzymes in their gut and

makes it so that they are unable to process their food. As an added benefit, it does not harm beneficial insects, so you could even use it in your outdoor garden. It is more expensive than some of the other products, so I save mine to use indoors.
How to use it: There are two ways you can use it with your hydroponic setup. First, you can make a foliage spray by mixing 1–2 ounces (30–60mL) of PureCrop1 into 1 gallon (3.8L) of water and spray away to your heart's content. If you are using it preventatively or as a biostimulant, then 1 ounce (30mL) per gallon (3.8L) should be sufficient. Switch to 2 ounces (60mL) per gallon (3.8L) if you see pests or pest damage. Second, you can make a root drench and use the PureCrop1 right in the hydroponic reservoir. To do this, you need to add 1.2 ounces (35mL) per gallon (3.8L) of water.

OPTION 8 - DIATOMACEOUS EARTH


Diatomaceous Earth - Food Grade
1/2 lb (227g)
Use Food Grade DE (diatomaceous earth) to help control
mites and pests inside your worm box. Diatomaceous Earth
is effective against any insect that has an exoskeleton.
Sprinkle some at the surface of your worm box.
Effective when dry.
Not for human consumption.
Feel free to contact us at info@wormbox.ca if you have any
questions regarding its use.
Terre de diatomée - Qualité alimentaire

Diatomaceous earth is lowest on my list of pest deterrents indoors. You have to be careful that you don't inhale any.

For me, this would be my last resort because I believe there are more risks than benefits and much easier and more effective methods of dealing with pests. Diatomaceous earth also comes with a list of limitations and precautions. First of all, it can be dangerous, especially if you get the wrong kind. You have to make sure you are getting food-grade and *not* industrial grade. Diatomaceous earth is made up of fossilized diatoms, which are unicellular algae and one of the largest groups of organisms on the planet. These little guys have microscopically sharp

edges, which is why we use them for pest control, but it's also why we don't want to inhale them into our lungs! Also, it loses all its power if it gets wet!

How it works: Remember how I mentioned that these little guys are sharp? It is that sharpness that works in our favor against soft-bodied pests. As the pests crawl over it, the diatomaceous earth essentially scratches their exoskeleton, then absorbs their moisture and causes them to dehydrate and die.

How to use it: *Very carefully.* You don't want to mess around with this one because it can cause real damage if you breathe it into your lungs. *First, make sure you're wearing a mask while you are working with it.* Second, make sure you are working in a well-ventilated area. All fans should be off, and you need to handle it slowly and carefully, so you don't cause any dust clouds. You also need to avoid getting it into the reservoir. It can clog both the pump and any tubing. Now I know I said it doesn't work if it gets wet, but that is my method of choice for using it. I mix 1 tablespoon of diatomaceous earth with 2 cups of water and *very carefully* spray it onto the leaves. This foliage spray works because it will dry out again and become effective against pests. You can also opt to dust it onto the plants, just keep the airborne particles to a minimum and definitely wear that mask!

REMEDIATION TECHNIQUES VS. HYDROPONIC PESTS

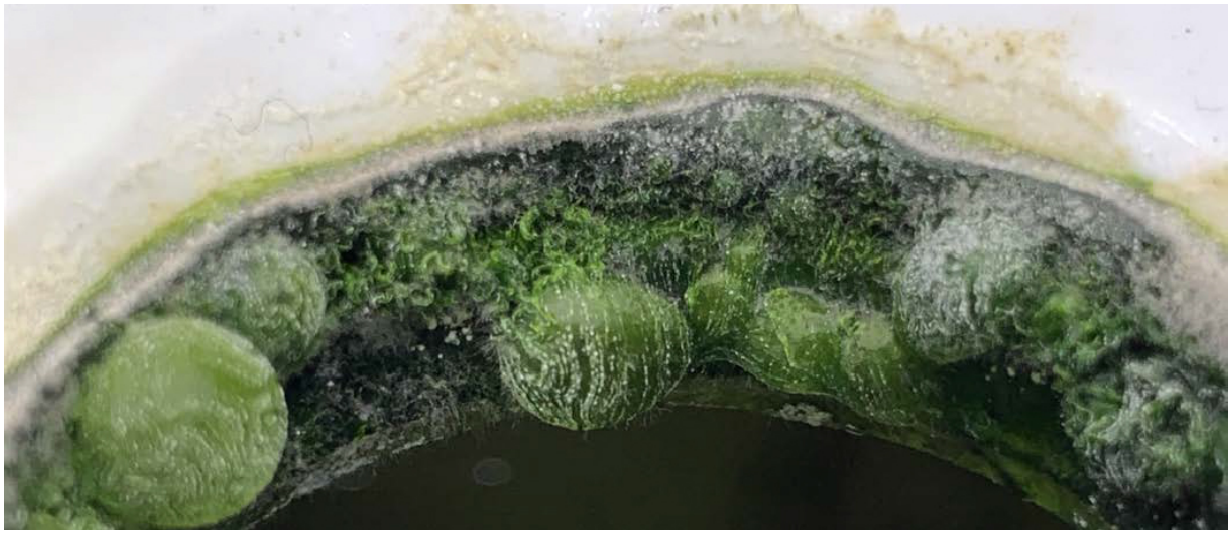
	THRIPS	APHIDS	FUNGUS GNATS	SPIDER MITES
Neem Oil	Yes	Yes	Yes	Yes
Bacillus thuringiensis subsp. israelensis (Bt or Bti)	Yes	No	Yes	No
Insecticidal Soap	Yes	Yes	Yes	Yes
PureCrop1	Yes	Yes	No	Yes
Nematodes *(Steinernema feltiae)*	Yes	No	Yes	No
Sticky Traps	Blue or Yellow	Yellow	Yellow	No
Diatomaceous Earth	Yes	Yes	Yes	Yes

Knowing When to Wave the White Flag

Even when you do everything right, it can still sometimes go horribly wrong. The truth is that sometimes you have to know when to wave the white flag and concede defeat. It sucks, and it can lead to an ugly cry, but sometimes it is the best thing to do. This can be especially true if you have multiple systems. Depending on what small hell you are battling, shutting down one system could save the rest of them!

SUMMARY OF COMMON HYDROPONIC PESTS, CAUSES, AND FIXES

PEST	POSSIBLE CAUSES	HOW TO FIX IT
Aphids	Overcrowding, poor air, circulation, infested plants	Use insecticidal soap, apply neem oil
Thrips	Dry conditions, infected plants, weak plants	Use sticky traps, apply neem oil
Fungus Gnats	Overwatering, algae growth, organic debris	Reduce moisture, use sticky traps, apply a 1:4 ratio mix of 1 part 3% hydrogen peroxide to 4 parts water to the roots
Spider Mites	Hot, dry conditions, lack of humidity control	Mist plants, use neem oil or insecticidal soap
Whiteflies	Poor airflow, infected plants, high humidity	Use yellow sticky traps, apply neem oil



Algae, the bane of any hydroponic growing journey. You can take steps to prevent it but chances are you will have to deal with it at some point. I took this picture (which I love) of a particularly bad algae bloom (which I did not love) in my AeroGarden Farm.

Diseases You May Encounter

One of the good things about growing indoors hydroponically is that you can avoid many of the soilborne diseases you would face in an outdoor garden. Unfortunately, there are still a variety of fungal, bacterial, and viral diseases that you may face even when growing indoors. Luckily, there are things you can do to reduce the chances that you have to deal with them, and many diseases are prevented by taking the same measures.

Fungal Diseases

The first step in treating fungal diseases is to learn about them and how to recognize them, and then we can try to prevent them. We will focus on the main five that you may encounter, and I will share some tips on how to stop them from taking over your system. All of these can spread quickly, so a speedy treatment is important if they occur.

POWDERY MILDEW

I have encountered powdery mildew many times in my outdoor garden, almost every single year on my winter squash and peonies. It is characterized by white, powdery looking areas on the leaves, stems, or even the buds. The main cause is high humidity and low air circulation. To prevent it, we need to make sure that we have good air circulation by using an oscillating fan and by staying on top of our pruning. We also need to make sure that the humidity is not getting too high in the area we are growing. A dehumidifier can help, but just make sure it is not making the air too dry, which can lead to other issues.

For indoor gardens, the best option I’ve found is PureCrop1, as it can help tackle any pest issues I may have missed, and I know it will also help strengthen the plants.

This fungal disease looks like a white, powdery substance usually on the leaves. It loves a warm and humid environment. If there is poor air circulation, it spreads even faster.

Downy mildew crops up when things are cool and humid. It can also spread quickly. Look for yellow or pale spots on the tops of leaves and fuzzy gray/purple growth underneath.

DOWNY MILDEW

I have yet to encounter downy mildew indoors or outdoors. Where powdery mildew is white, downy mildew likes to show off some colors. Look for brown or yellow spots on the tops of the leaves. This is the damage caused by what is actually lurking underneath. If you look on the underside of an affected leaf, you will most likely find a gray or purple mold lurking. Downy mildew takes hold when there is no air circulation and the humidity is high. If you notice it on your

plants, remove any of the affected leaves, get a fan going, and do some more pruning to get that humidity down.

This fungal disease is also called gray mold. It is characterized by soft, grayish-brown rot on leaves, stems, and flowers. It creeps up in humid environments and spreads very quickly.

BOTRYTIS (GRAY MOLD)

Botrytis is a gray-brown mold that occurs on just about all the parts of your plants. Look for it on fruit, flowers, stems, and leaves. As with the other fungal diseases we have looked at so far, it is caused primarily by high humidity and poor air circulation. It likewise can be prevented by using an oscillating fan and keeping tabs on the humidity so it doesn't get too high. If you notice it on any parts of your plants, make sure to remove them.

PYTHIUM (ROOT ROT)

This is probably the fungal disease I have tangled with the most, especially at the start of my indoor growing adventure. When you are growing food indoors hydroponically, you have to think about roots in a way you don't for an outdoor garden. I was always so focused on what was going on *above* the nutrient solution that I often forgot to look underneath. Healthy roots are lovely, white, and smooth. If your roots are slimy or mushy and brown, then you probably have root rot. It can also be kind of stinky. The cause is typically a lack of oxygenation in the nutrient solution. Many baddies thrive in an anaerobic (low oxygen) environment. By adding more air (more aerobic), we tip the balance in favor of the goodies.

Temperature can also play a role, so we want to keep water temperature at or below 72°F (22°C).

Root rot loves a warm and low-oxygen nutrient solution environment. You will know you have it if your roots are no longer smooth and white and are instead brown and slimy.

If you want something to help protect your roots, you can use something like HydroGuard for a bit of root insurance.

You can also see signs of root rot without looking at the roots. For example, you may see the leaves are suddenly getting a bit yellow, they may wilt (especially the lower leaves), and the plants might be smaller than others. To deal with root rot, it is best to get into the habit of taking a look at your roots weekly. Healthy roots = Healthy plants. If you wait for signs above the roots, the plant may be too far gone to save. Wilting, stunting, and yellowing can have many other causes, so

definitely check the roots before you try treating for other causes. If you are running into this issue with your system, we need to talk about steps to prevent it in the future. Adding an air pump is a great way to inject more air into the nutrient solution. It is also great for your plants even if their roots are healthy. Keeping a clean system is also key, and adding some food-grade 3% hydrogen peroxide can help. To do this, mix 1 tablespoon (15ml) of hydrogen peroxide per 1 quart (1 liter) of nutrient solution. It is also key to change out your nutrient solution to help keep things in balance and to get rid of any potential solutions building up in it. I like to stack the odds in my (and my plant's) favor and leverage beneficial microbes that help keep my plant roots in top form. Another option is to use a prepackaged solution. One I have used and really like is HydroGuard. It contains *Bacillus amyloliquefaciens*, which produces enzymes that help it fight off the root rot pathogen, *Pythium*. There are others out there, and a quick internet search brings up lots of options. Just make sure the one you choose is listed as being safe for hydroponic systems.

FUSARIUM WILT

This one looks very much the same as *Pythium*, as it presents with the same yellowing, wilting, and browning of leaves and roots that stink and are brown and mushy. It differs in that the damage it causes is slower than *Pythium*, with the roots not showing signs of damage at first. It causes a characteristic one-sided wilting. It is typically more prevalent in soil than in hydroponics. It can make its way into your system through infected seeds or tools. I have a strict rule of keeping outdoor plants and tools outdoors. I have separate tools for indoors. I learned this lesson the hard way as I mentioned in my sad tale about the thrips.

Fusarium wilt is one that you really do not want getting into your system. It is *very* hard to get rid of. Prevention is key, and it's just one more reason to keep a clean system. Adding food-grade 3% hydrogen peroxide works for Fusarium wilt as well as *Pythium*. You can also look for products that contain *Trichoderma harzianum*, which can help outcompete the *Fusarium oxysporum* fungus.

Bacterial Diseases

As if the fungal diseases were not enough, we need to delve into the bacterial diseases. That said, I have encountered the fungal diseases far more than I have tangled with bacterial or even viral ones. The good news is that they are way less

likely to occur, but if they do occur, they can easily take out your entire system because both are spread through water. Cleanliness is key!

Fusarium wilt is typically a soilborne fungal disease that invades plant roots and inhibits water transport, causing wilting, yellowing, and eventual plant death. It can be brought into hydroponic systems via contaminated tools, water, or plants.

BACTERIAL LEAF SPOT

Two bacteria cause this disease: *Xanthomonas campestris* and *Pseudomonas syringae*. This disease causes watersoaked areas on leaves that tend to turn black or brown. In a hydroponic setup, it typically targets plants like peppers, lettuce, and other leafy greens. It can also show up on other things like basil and Swiss chard. It is triggered when plants are overcrowded, humidity is high, and contaminated water has been introduced into the system.

With bacterial leaf spot, look for dark, water-soaked areas on leaves. These can have yellow halos. It spreads quickly when it is warm and humid. A great way to keep it at bay is to make sure your tools are clean, and be careful what plants you introduce from outside.

Bacterial wilt kills quickly! It impacts a plant's ability to transport water, which shows up as sudden wilting and collapse.

BACTERIAL WILT

This disease is caused by the *Ralstonia solanacearum* bacteria, and it is not one you want in your hydroponic setup. It kills quickly and targets favorite plants such as tomatoes, peppers, eggplants, and lettuce. When present, it can cause sudden wilting or dramatic collapse of the plants because the bacteria blocks the vascular system of the plant. Water can't circulate through the plant even if it is growing in

water hydroponically. Many of these diseases have overlapping symptoms, but this one has a distinctive characteristic. If you cut open the stem of an infected plant (it's going to die anyway), you will most likely see brown streaks inside the stem.

This disease enters plants through wounds either on the roots or the plant itself, and it enters your home via water, tools, seeds, or growing material that has been contaminated. It has a nasty habit of lurking in biofilms and can be hard to get rid of once it enters a hydroponic system because it spreads easily through water.

Be warned that if you smoke and you skip washing your hands, you risk spreading CMV to your plants.

Viral Diseases

These are much less likely when growing food indoors hydroponically. Some can enter your home on the very seeds you intend to plant, so knowing what these diseases look like and how to deal with them is still important.

TOBACCO MOSAIC VIRUS (TMV)

While it bears the name of tobacco, tobacco mosaic virus has the ability to infect over 300 different species of plants. In a hydroponic setup, it likes to target things like lettuce, cucumbers, peppers, and tomatoes. It is a bit different because it is not spread through pests but by contact from infected surfaces. It could be things like contaminated seeds, tools, or your hands if you are a smoker! Make sure you wash

your hands (smoker or not, it’s always good practice, especially before handling seeds) and sterilize your tools. It has a characteristic mosaic pattern that is displayed on leaves, giving them a patchy, light/dark green coloring with hints of yellow. The plants can also be stunted. This virus weakens plants, so that they are also susceptible to other issues.

Aphids are a key vector for TMV, which causes patchy, small, and weird-looking leaves. It also really impacts the plant’s overall growth and impacts the yields produced.

CUCUMBER MOSAIC VIRUS (CMV)

This viral plant disease presents with leaves that are yellow and distorted and reduced production of fruit. It can affect a variety of plants, but in a hydroponic setup, it tends to favor its namesake—cucumbers—as well as peppers, tomatoes, lettuce, and herbs. It is primarily spread by aphids but can also make its way into your home through infected seeds or tools that have been used on infected plants and not properly sterilized. It leaves a hallmark mosaic pattern on leaves, and unfortunately there is no cure once a plant is infected. It can spread quickly, and weakened plants are more susceptible. It can target more than 1,000 plant species.

LETTUCE MOSAIC VIRUS (LMV)

Luckily, this virus sticks closer to its namesake, targeting things like lettuce and spinach. It can be spread primarily by aphids or infected seeds. You can see how even if you do everything right, sometimes things can still go wrong if something hitches a ride into your home on the seeds you need to grow! When infected plant leaves (especially older ones) yellow, the lettuces will fail to have good head

formation. You may see a mosaic pattern on the leaves, and they can also become distorted and curled.

Lettuce mosaic virus is very similar in appearance to cucumber mosaic virus in how it impacts the leaves. It often makes its way into hydroponic setups from aphids and infected seeds.

Summary of How to Prevent Plant Diseases

- Keep your system clean
- Maintain proper airflow and control humidity
- Sterilize your equipment, keep outdoor tools outdoors!
- Ensure good water circulation and oxygenation
- Keep an eye on your plants so you can catch disease symptoms early
- Use beneficial microbes or hydrogen peroxide to suppress pathogens
- Get rid of infected plants quickly and don’t compost them!

Other Gross Things You May Encounter

But wait, there’s more. As if everything listed above wasn’t enough, we now enter the world of gross and slimy things. I am talking about the dreaded algae, biofilm, and nutrient buildup. Let’s take a look at each in turn.

ALGAE

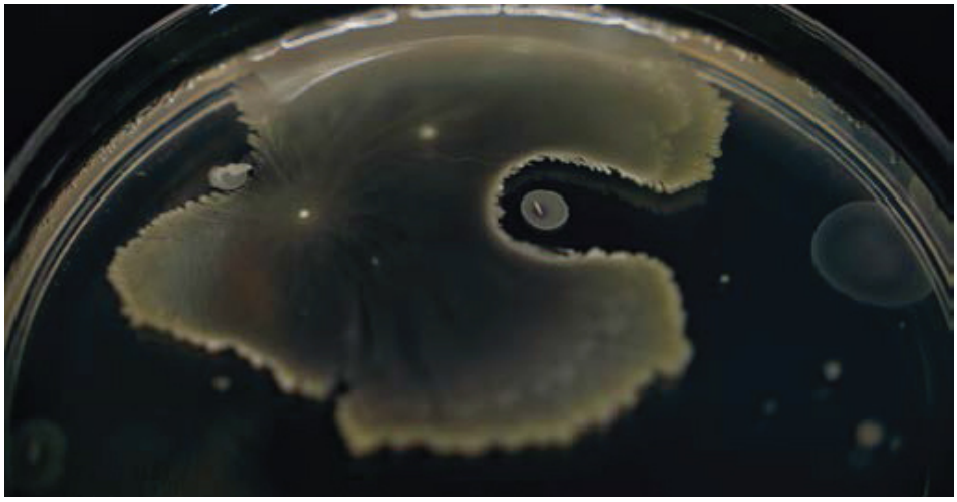
This was a particularly bad infestation of algae, the dreaded green stuff. I honestly don't even remember how it got so out of control!

If you are dealing with an algae bloom, you need to take stock of where light is gaining access to the nutrient solution and work to block it moving forward.

Ah, the dreaded green stuff. If you let this green, slimy buildup take hold in your system, it can harm your plants in a multitude of ways. But what is algae? They are just simple, plant-like organisms that use photosynthesis to survive. This means in order to exist, they need water, nutrients, and light just like the plants you are trying to grow. Unfortunately, this means they are also able to hurt our plants in a few ways: From starving your plants of oxygen by reducing the dissolved oxygen in the water to stealing nutrients from your plants as algae gobbles them all up. It can also clog pumps and tubes that will hinder the performance of your system. Additionally, it can mess with the pH of the nutrient solution, causing it to fluctuate and making it harder for you to keep the pH in the ideal range. Don't lose hope! I have mentioned it a few times already, but algae is (mostly) preventable.

We just need to remember this key equation:

While we most definitely cannot remove the water and nutrients from this equation (as those are key to the functioning of our system), we can adjust the light. Let's look at ways we can keep light out of the nutrient solution. This lets our plants benefit from all its goodness, and they still have access to light above the nutrient solution. This way, we tip the balance into our plants' favor and against the algae.



Biofilm is tricky to get rid of due to its sticky nature and habit of it lurking in hard-to-reach areas of your system.

If you are not using all the available holes in your system (and you shouldn't be), then we need to make sure we are covering any of the open holes with the hole covers for your system, 3D-printed versions, or anything else that is opaque, such as golf balls. We also want to make sure that the top of the growing medium is covered as much as possible while still leaving room for light to reach our growing seedlings. AeroGarden uses its stickers, which you should not remove. Rise Gardens uses foil coverings, and Click & Grow does it best with the reusable caps that click onto its pods. There are also 3D-printed caps you can find for all three systems. In a pinch, I have even used aluminum foil, but you have to make sure there are no sharp edges that could cut into delicate plant stems. If you have any exposed tubing in your system, make sure that it is opaque, not clear.

If you do end up with an algae bloom, and you probably will at some point, make sure that there are no areas that light is getting in. One handy way to figure this out is to see where the greatest concentration of algae is. Once you close any gaps, you will need to thoroughly clean your system. It can be helpful to add some foodgrade 3% hydrogen peroxide to your cleaning water. Once the system is clean, you can refill it and add some of that same hydrogen peroxide into the grow bowl to help keep the algae at bay. Adding an air stone is another great option, and you will also want to make sure to keep tabs on the water temperature. Try to keep it between 65 and 70°F (18 and 21°C).

BIOFILM

Biofilm is a slimy layer that builds up on surfaces of your hydroponic system that are exposed to water. It always makes me think of Slimer from *Ghostbusters*. It can lurk inside the grow bowl, inside the grow deck in AeroGardens, inside tubing, and in other places. It is mostly bacteria, and the film itself is what they create to protect themselves. We want to take steps to prevent it from occurring since it can be very hard to get rid of once it is in place. It can also offer a refuge for diseases like *Pythium* (root rot), so this is no joke. Unlike algae, biofilm does not even need light to survive!

If you have biofilm, then you need to roll up your sleeves and get to work. Empty out your system and give it a good scrub. We don't want to scratch the surfaces, so don't go grabbing steel wool or anything, but biofilm is sticky and doesn't come off easily. Hydrogen peroxide (3% food grade) can help. If it is really bad, you may want to opt for doing a deep cleaning using bleach (see here). Once the system is clean, take steps to prevent it from coming back. Biofilm loves stagnant water, so make sure that there is enough water circulation. If you don't already have an air stone installed, it may be time to add one. Keep the water temperature cooler. As with preventing algae, we want to keep it between 65 and 70°F (18 and 21°C).

Nutrient buildup tends to happen when the salts in the nutrient solution build up, and then plants suffer. You can prevent it by regularly flushing your system, keeping tabs on your EC levels, and using a well-balanced nutrient solution.

NUTRIENT BUILDUP

If you are noticing a weird, white, chalky buildup on the surfaces of your system, then you may have nutrient buildup. It can be an issue because it can start to clog small openings like tubing and drip emitters. Additionally, it can lead to nutrient imbalances and root burn, invite in algae and biofilms, and mess with the EC and pH of your nutrient solution. Its name pretty much sums up the issue: you have too many nutrients in your nutrient solution. Those excess nutrients have crystallized out of the solution, causing the chalky, white buildup that some people call “salt buildup.”

Edema is most common on peppers. One sure sign is if you have these crystal-like bumps under the leaves.

This issue can be caused by multiple factors—using hard water (with too many dissolved minerals), water evaporation, lack of nutrient absorption by plants,

overfeeding (don’t fall into the trap of thinking more is better), and lack of cleaning, to name a few. The best way to avoid it is by only adding the recommended amount of nutrients, checking your EC, and cleaning your system regularly.

EDEMA

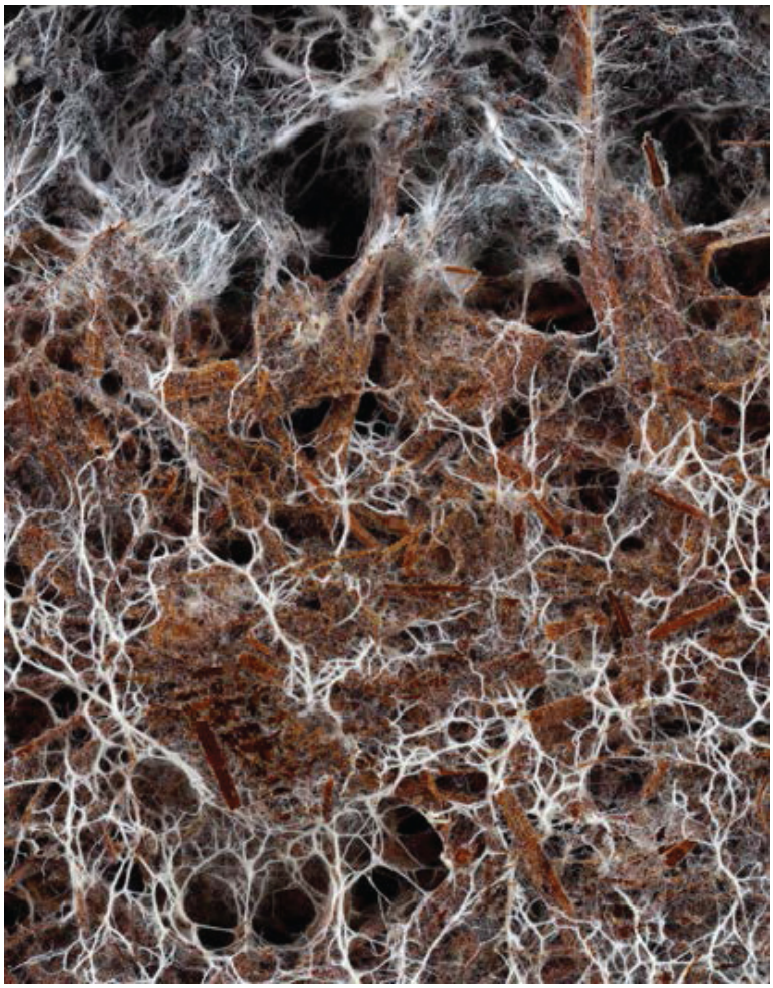
Edema is something you typically see on peppers, and it looks like little “crystals” that appear on the leaves. It is a disorder and not a disease, which is good news if you spot it. It occurs when there is a water imbalance within the plant, causing it to absorb more water than it needs. When this happens, the cells within the plant burst, causing blister-like bumps on the leaves that then harden.

Edema is likely to occur if the humidity is high, air circulation is poor, temperature is low, and aeration in the nutrient solution is lacking. To prevent it, we need to keep temperatures around 70–75°F (21–24°C). We can increase aeration in the nutrient solution by adding an air stone. Adding an oscillating fan is one of the quickest and easiest ways to get rid of and prevent edema.

ONE OF THE GOOD GUYS!

Mycelium is not a mold, but it is often mistaken for one. Instead, it is a beneficial fungus that won’t harm your plants. It is fuzzy and white, and it often shows up on grow pods before the seeds have even started to germinate. Outdoors, these mycelium play a huge role in expanding the plant’s nutrient and water absorption capabilities and help create a stronger plant. Nothing freaks out a majority of new hydroponic growers more than fuzzy, white stuff appearing on grow pods. When it is mistaken for mold, people start suggesting using cinnamon. Even for actual mold, typical cinnamon from the store is not what you need to fight off plant issues. You would need Ceylon cinnamon, which is much more expensive, so save it for baking. Nothing needs to be done to mycelium when it appears. It won’t harm your plants, they will eventually outcompete it, and it will disappear.

Trichoderma is another beneficial fungus that can act as method of controlling pathogens through parasitism and nutrient competition. You can even add it into your reservoir to help promote plant growth—it will increase root mass and improve nutrient uptake.



Often assumed to be one of the bad guys, mycelium will not harm your plants, and eventually they will outcompete it.

HOW TO TELL IF IT'S MYCELIUM (BENEFICIAL FUNGUS) VS. HARMFUL MOLD

FEATURE	MYCELIUM	HARMFUL MOLD
Color	Bright white	Off-white, gray, greenish
Texture	Thin, fine, thread-like, web-like threads	Fuzzy or cottony; clumpy
Growth Pattern	Spreads evenly around seed or in the radial pattern	May clump or spread in patches, can appear blotchy, uneven, or as dense tufts
Smell	Earthy, mushroomy smell	Smells "off," kind of musty or sour
Location	Mycelium often grows around healthy, germinating seeds– some seeds are coated in beneficial fungi (like Trichoderma)	Mold, insects on or under leaves

	or develop them naturally	

Nutrients come in all different shapes and sizes. Some are "one and done," like the AeroGarden and Fox Farm Grow Big nutrients, and others, like the Advanced Nutrients and Rise Garden nutrients, have three components that are used at different stages of the plant life cycle. The three-part nutrients are better suited to giving plants exactly what they need, but can be overwhelming for newbie growers who just want a simple setup.

HYDROGEN PEROXIDE TEST

If you are really worried that something might be mold, you can do this simple test:

1. Lightly mist the fuzzy area with diluted hydrogen peroxide (1 part 3% peroxide to 10 parts water).
2. Look for a reaction. Mycelium usually doesn't react much, but mold and fungal pathogens will slightly fizz as they react with the peroxide.

Nutrient Imbalances

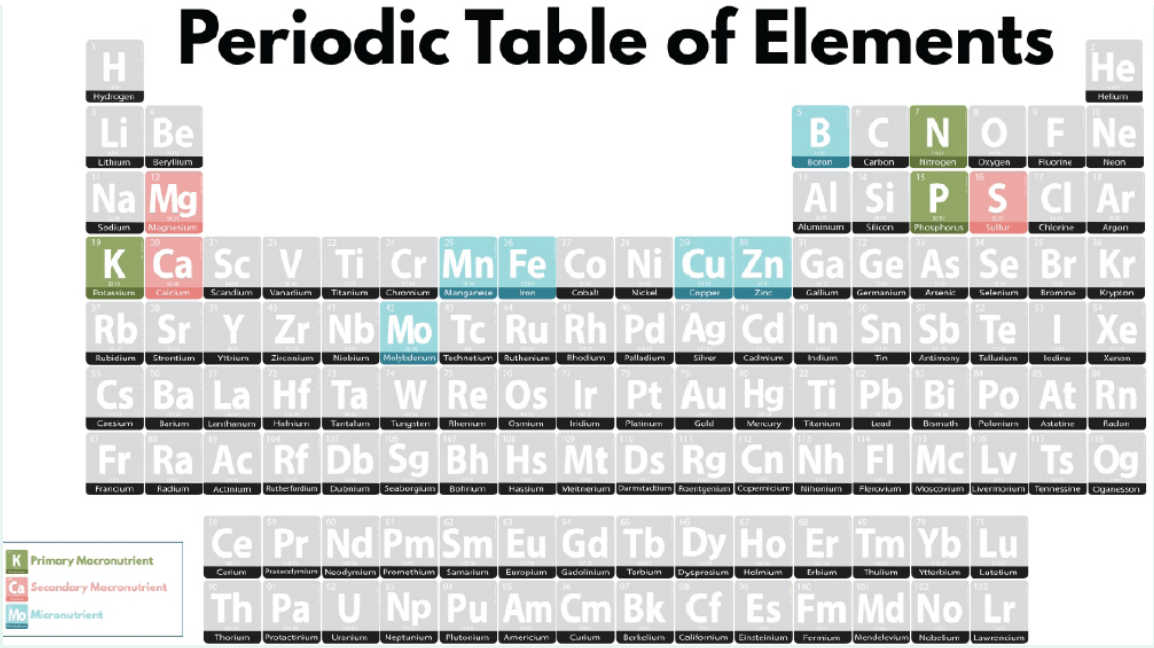
Besides pests and diseases, another common issue is too much or too little of one or more nutrients. When we are growing hydroponically, our plants rely on us for all of their nutrients. In an outdoor garden, they can get nutrients from the soil and mycelium that surround them. Indoors, they are not so lucky. If we are not feeding

them properly, they will suffer for sure. In this section, we will take a look at the different nutrients to consider, how to tell if they are not balanced, and what we can do about it. The good news about nutrient imbalances is that they are almost 100% within our ability to prevent and control.

As we explore the world of nutrients, I think it is important to understand that, unlike pH and EC, there is no easy way to test for the nutrient composition of your nutrient solution at home. There are no test strips, liquids, or at-home meters that you can use. To test these properly, you need a lab with specialized equipment, and most of us don't have access to that. Now, that doesn't mean we should throw up our hands and call it a lost cause. It just means we have to learn other ways to diagnose these issues. Luckily, there are some basic things we can do, like keeping our systems clean, keeping pH and EC within the ideal ranges, and making sure our plants are healthy, that will go a long way to avoiding issues. On top of that, learning the signs of how each imbalance presents itself is key. While it is not an exact science at home, we are not without tools to add to our tool belts.

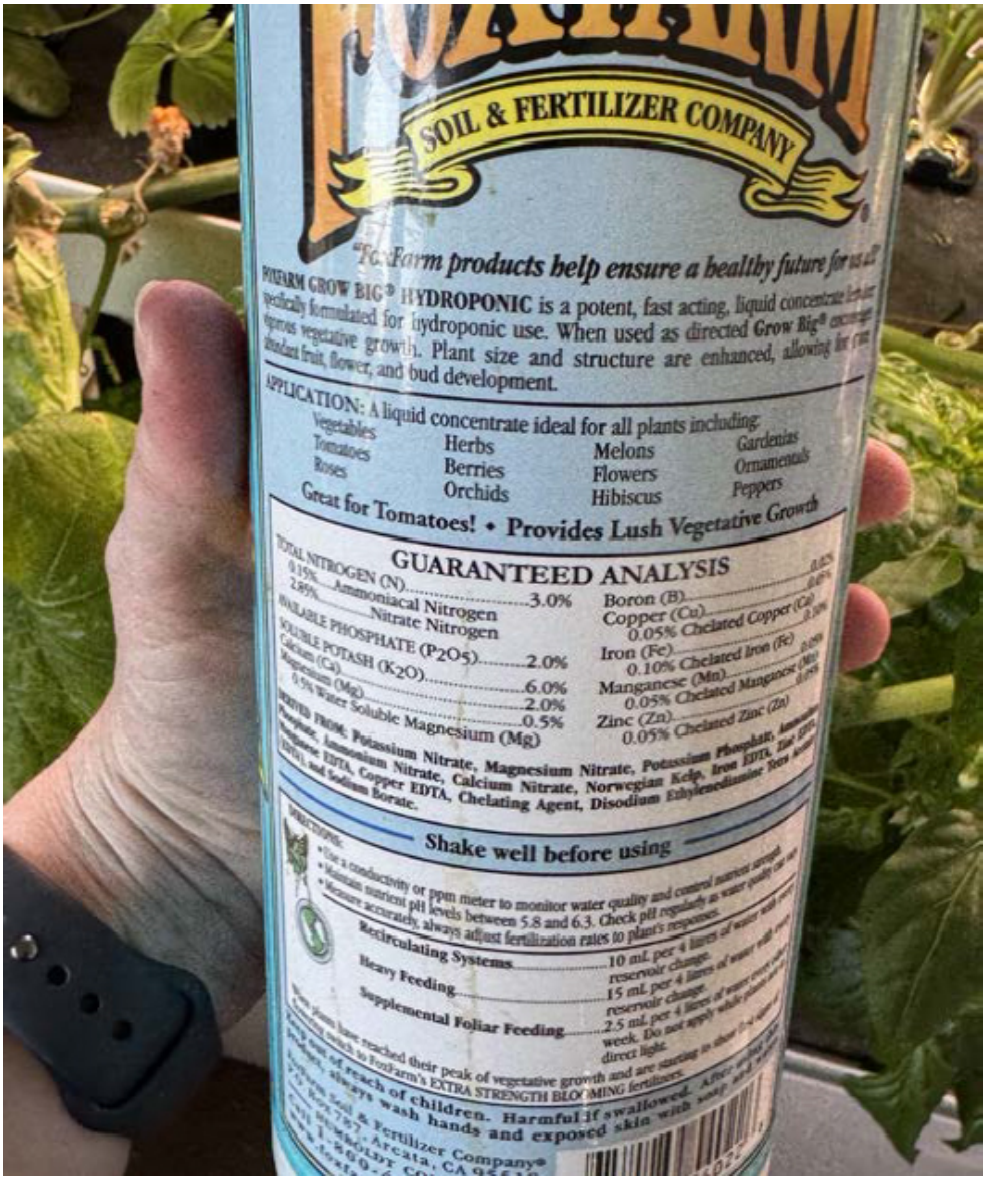
Know Your Nutrients

Do you remember back in school when we all learned that plants use the sun to make their food? So, why do they need nutrients? We give them grow lights in our systems. Isn't that enough? Nope, it isn't. Even though plants use the sun to facilitate photosynthesis, they also take all the nutrients and other goodies from the soil to grow big and strong when they are outdoors. The photosynthesis helps plants produce energy, but the nutrients help them build their physical structures and maintain their different biological functions. The nutrients are truly the building blocks that provide the raw materials for plant growth. They help plants build cells; produce roots, leaves, stems, and fruit; and transport water. Now it is time to head back to chemistry class, dust off your periodic table of the elements (bonus nerd points if you actually have one), and look at the macronutrients and micronutrients that are going to help your plants thrive. See pages 172–186 for more on macronutrients and micronutrients.



Here is a periodic table of the elements highlighting the macronutrients and micronutrients we will focus on.

Cal-Mag is a helpful additive that will ensure your plants are getting enough calcium and magnesium. As with any additives, more is not necessarily better. Make sure you are using it as directed.



The guaranteed analysis gives you the detailed breakdown of exactly what is in the nutrients and how much there is. This is important so you can choose the right one for your growing situation.

How to Recognize a Nutrient Imbalance

There are two main groups of nutrient deficiencies: one of macronutrients and one of micronutrients. Imbalances in either group can have big effects on the health of your plants, so knowing what to look for and how you can correct it is important. Remember, there is no easy way that you can test for these imbalances at home, so we need to learn what to look for and know what things we can do with our best guess at what is going wrong. Luckily, there are basic things you can do to prevent

and reset if you think you have a nutrient imbalance. I summarize them on here toward the end of this chapter.

For most of us hobby hydroponic growers, trying to fix individual nutrient imbalances without proper testing in a lab is likely to do more harm than good. In order to provide good information and maintain both our sanities, I've provided a consolidated list of the best practices you can use to reduce your chance of having imbalances in your system. This means fewer headaches for you and a better growing environment for your plants. When it comes right down to it, if your plants are showing nutrient imbalances, unless you are pretty sure it is a calcium or magnesium deficiency (in which case, toss in some Cal-Mag), your best bet is to flush your system and start fresh. Then, take a look at the nutrients you are using to make sure they are complete and well suited to the plants you are growing.

Preventing Nutrient Imbalances

Here are the best practices for preventing nutrient imbalances in your system:

- Keep your pH between 5.5 and 6.5 for proper nutrient uptake, as many nutrients are pH sensitive.
- Keep EC in the ideal range for the plant(s) you are growing to ensure correct nutrient concentration.
- If you are just starting out, an all-in-one nutrient mix can help keep things simple. If you don't run into issues, you can keep using it. However, an all-stages mix is most likely not meeting all your plants' needs. As you gain confidence, it can be helpful to move to a feeding schedule that provides different formulas based on the plants' stage (vegetative vs. fruiting). If you are just growing lettuce and leafy greens, an all-in-one mix might be all you need.
- Use an oscillating fan (on low) to ensure good airflow and keep the humidity in check.
- It can be helpful to add nutrient solution, as well, rather than just water, whenever you might need to top up your reservoir. If you just keep adding water, you will dilute the nutrient concentrations and cause issues.
- Water matters. If you are using tap water to make your nutrient solution, leave it out for 24 to 48 hours to allow any chlorine to evaporate. If you are using

distilled or reverse osmosis water, then sulfur can be absent.

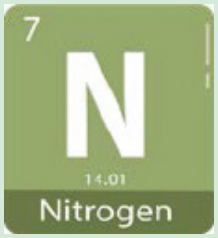
- Add an air stone to your reservoir to make sure there is enough oxygenation for your plant roots and to reduce stagnant water.
- Keep tabs on your water temperature. If it is too cold or too hot, your plants' nutrient uptakes can be impacted.
- Use a premade and well-formulated hydroponic nutrient mix. Don't try making your own fertilizers unless you are an expert (in which case you probably aren't reading this book).
- If you find that you have an imbalance of a specific nutrient, check the guaranteed analysis on the bottle to see if it contains too much or not enough of the specific nutrient. You can always try switching to a different one that has a different makeup.
- If you think your nutrients are out of balance and you are not sure what to do, perform a full-system cleaning. By flushing your whole system, starting again with clean water, and adding a well-balanced premade nutrient solution, you can correct a lot of issues.
- Look at your plants, keep tabs on them, and watch for signs of issues. Ignoring things has rarely made things better, so if you see an issue, take action.
- Follicular sprays are helpful for molybdenum, copper, manganese, zinc, iron, and calcium because they are quickly absorbed.
- If you are going to try to add a supplement of a nutrient you believe is deficient, please do it slowly! It only takes a bit to go from a deficiency to a toxicity issue. Your best bet is to flush the system and start fresh.

Macronutrients

Macronutrients are the main nutrients, six in total, that plants primarily rely on for their growth and functioning. They are the ones needed in the largest concentrations and are essential to your plants' survival. There are many more nutrients to consider, but these are the main players. If you get these right and understand the part they play in growing food, you are off to a great start. They are broken up into two groups, primary and secondary, and we will look at each in turn.

PRIMARY MACRONUTRIENTS

The primary macronutrients are nitrogen, phosphorus, and potassium, or as I like to call them, “The Big Three.” They are the main nutrients plants rely on in both the vegetative and the flowering phases. If you have ever bought any fertilizers or nutrients for either indoor or outdoor plants, then you should have seen three numbers on the front of the bottle (or bag). These represent the N-P-K values. Nitrogen is stated first, then phosphorus, and finally potassium. Different plants will thrive with different formulas, and the formulation that you should use can also depend on the stage of plant growth.



N STANDS FOR NITROGEN

Of The Big Three, Nitrogen (N) stands as the biggest. It is one of the most important nutrients for overall plant health. It is essential to help plants make the fundamental building blocks of their cells, and it plays its biggest role during the early growth (vegetative) stages by helping fuel leaf and stem growth. Skimp on the nitrogen early in your plant's life cycle, and they definitely won't thank you for it. Conversely, giving too much nitrogen later in life can work against you in fruiting plants. Looking at the guaranteed analysis on your nutrients, most noticeable will likely be Nitrogen (N), with a subnote about the amount of nitrate (NO_3-) and sometimes ammonium (NH_4+). If you are growing lettuce and other leafy greens, nitrogen will be your friend. Let's look at some of the other ways nitrogen helps your plants grow.

- Nitrogen is used by plants to produce enzymes and proteins essential for all plant structures. It helps support metabolic activity.
- Nitrogen is a key part of chlorophyll, the green pigment you see in leaves that plants use to capture sunlight for photosynthesis. Photosynthesis helps plants turn sunlight into energy that they can use.
- Nitrogen supports vegetative growth, giving plants lush, green leaves and strong stems that will help support the plant as it grows.
- Nitrogen is a part of nucleic acids (DNA and RNA), which are key for cell division and growth.

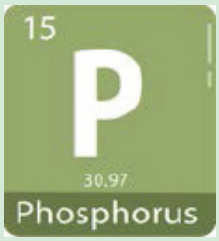
Nitrogen deficiency causes the older leaves to start turning yellow because nitrogen plays a key role in the production of chlorophyll.

Symptoms of Nitrogen Deficiency

- Lower leaves (the older ones) can start developing a uniform (not patchy) yellowing (chlorosis)
- Plants are stunted, making them small and weak with thin stems
- Leaves can be sparse and small; they may wilt or drop off
- Flowers and fruit development are delayed

Symptoms of Nitrogen Toxicity

- Fruit and flowers are delayed or just never seem to show up
- Loads of dark green and dense leafy growth
- Stems are leggy and weak
- Plants are prone to pests and diseases



P STANDS FOR PHOSPHOROUS

Phosphorus (P) plays a big role during the plant's early growth, root development, reproduction, and resistance to stress. It can be found in the guaranteed analysis as available phosphate (P_2O5). When plants enter the flowering and fruit development stages, their need for phosphorus really increases.

- Phosphorus is part of the plant's main energy system, ATP (adenosine triphosphate), which powers just about every process in the plant, including nutrient uptake, cell division, and growth.
- Phosphorus helps plants grow strong root systems that efficiently absorb water and nutrients.
- Phosphorus helps with the formation of flowers, fruits, and seeds.
- Phosphorus supports photosynthesis through the formation of essential enzymes.

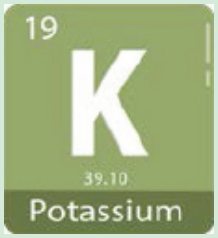
Phosphorus deficiency isn't something you see often when growing hydroponically. If it occurs, it tends to throw off other nutrients, causing secondary deficiencies.

Symptoms of Phosphorus Deficiency

- Leaves and stems develop a purplish/reddish color (especially under the leaves of tomatoes, peppers, and basil), caused by a buildup of anthocyanins
- Poor flower or fruit development
- Stems that appear thin and weak
- Weak root systems that can struggle to take up water and nutrients
- Stunted growth or slow development, especially when plants are young

Symptoms of Phosphorus Toxicity

- Dark leaves that may have a purple hue on the edges
- Stunted growth and poor root development
- Flowers and fruit that are delayed or never form
- Plants may wilt even though they are surrounded by water



K STANDS FOR POTASSIUM

Potassium (K) is a little bit different from the other two. You see, unlike nitrogen or phosphorus, it doesn't become part of the plant tissues. That doesn't mean it isn't essential for plant health. It plays a big role in several key processes that help plants function efficiently. You will often see it listed on your nutrients in the guaranteed analysis as soluble potash (K_2O). Potassium is especially important during the fruiting stage for plants like tomatoes, peppers, strawberries, and cucumbers. If they don't get enough at this crucial time, you can end up with less fruit that is smaller and less sweet. Potassium helps plants grow in a few ways:

- Potassium improves plants' stress tolerance by helping to build strong plant cell structures. This means stronger, thicker stems that can better withstand pests and disease.
- Potassium controls the opening and closing of the pores (stomata) on the leaves, which help regulate water balance.
- Potassium enhances the quality and amount of fruit because it helps in the transport of sugar and carbohydrates.
- Potassium helps with photosynthesis by enhancing chlorophyll production.

Too little potassium often leads to leaf edges that are yellow or brown, weak stems, and plants that are just stressed and not looking their best.

Symptoms of Potassium Deficiency

- Plants are growing slowly, and they have weak stems
- Plants are getting sick from pests and diseases
- Plants are producing small, weird-looking fruit that doesn’t have any sweetness
- Plant leaves (especially the older ones) have edges that are going yellow or brown; leaves may also be curling

Symptoms of Potassium Toxicity

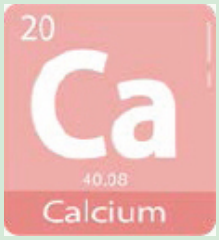
- Rare when growing hydroponically
- Edges of old leaves can have some burning
- Issues with fruit production

SUMMARY OF PRIMARY MACRONUTRIENTS

NUTRIENT	MAIN FUNCTION	AFFECTED LEAVES FIRST	DEFICIENCY SYMPTOMS AND SOLUTIONS	COMMON DEFICIENCY CAUSES
Nitrogen (N)	Leaf and stem growth, chlorophyll production, amino acids and proteins	Older (lower) leaves	Lower nutrient strength, flush system	Low N in solution, poor nutrient mixing, overwatering
Phosphorus (P)	Root development, energy transfer (ATP), flowering and fruiting	Older (lower) leaves	Adjust pH with buffer solution	Cold root zone, low P in mix, incorrect pH (<5.5 or >7)
Potassium (K)	Water regulation, enzyme activation, disease resistance, fruit quality	Older leaves	Cool environment, increase airflow	Low K in formula, high Ca or Mg outcompeting K

SECONDARY MACRONUTRIENTS

This is the second tier of “The Big Boys.” These are still essential for healthy plants, but they are needed in smaller amounts than nitrogen, potassium, and phosphorus.



CA STANDS FOR CALCIUM

Calcium (Ca) isn’t giving plants milk moustaches or making their bones strong, but it is helping them build structural integrity and maintain cellular functions. It will usually show up under the guaranteed analysis as calcium (Ca). It plays a key role when your plants are actively growing, specifically the vegetative and flowering stages. Let’s look at some of the other ways calcium helps plants grow:

- Calcium helps plants build and maintain strong cell walls, helping them stand upright.
- Calcium helps activate key enzymes for photosynthesis, respiration, cellular division, and elongation.
- Calcium helps plants regulate their uptake and transport of other nutrients and water movement through the plant.
- Calcium helps with maintaining the stability and function of cell membranes.

The yucky dark spots are the bottoms of tomatoes, peppers, or zucchini. Blossom end rot is due to the plant not being able to move calcium efficiently.

Symptoms of Calcium Deficiency

- Calcium is immobile in plants (not able to move from older leaves to new ones). Look for symptoms in young leaves; they will often show issues first. You may notice leaves curling, cupping, or crinkling. They may also develop brown spots. If you're growing lettuce, you may notice burning on the tips of the leaves.
- Look for stunted growth, with new shoots and roots failing to develop properly. You may even notice the root tips dying off.
- If you have ever grown tomatoes, you have probably heard calcium (or a lack thereof) associated with blossom end rot. It is a common issue in fruiting plants and can also affect peppers and zucchini.
- Weak stems that break easily.

Symptoms of Calcium Toxicity

- New leaves can exhibit yellow or brown "burning" on the edges
- New shoots appear stunted or distorted
- You might notice salt crusting in your reservoir

MG STANDS FOR MAGNESIUM

Magnesium (Mg) is key during the vegetative and flowering stages of your plant's life cycle. It is mobile in plants, so it can move from older leaves to support new growth. It plays a crucial role in photosynthesis and other cellular processes. In your guaranteed analysis, you will usually see it just listed as magnesium (Mg), and it might have a subnote with the amount of water-soluble magnesium.

- Magnesium acts as the central atom in chlorophyll, which is necessary for photosynthesis, so that plants can convert light energy into chemical energy that they can use.
- Magnesium supports overall plant growth and energy production by helping with the activation of enzymes used in key metabolic processes.
- Magnesium helps plants move sugars, water, and nutrients (specifically phosphorus).
- Magnesium is used in the creation of DNA and RNA, which are needed for plant growth and repair.

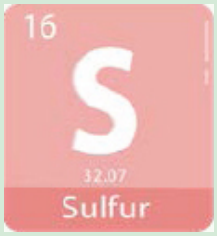
This is another deficiency that can cause interveinal chlorosis on older leaves, which also sometimes shows spots that can be reddish or purple.

Symptoms of Magnesium Deficiency

- Leaves may fall off early
- Plants have stunted growth and slow development.
- Interveinal chlorosis (yellowing between veins) on older leaves
- Old leaves can have a slight upward curl or be a bit brittle

Symptoms of Magnesium Toxicity

- Leaves may fall off early
- Spots on the leaves that can be yellow or brown
- Tips of the leaves may become dry



S STANDS FOR SULFUR

Sulfur (S) is needed for all stages of plant growth but plays its biggest role during early growth and flowering. It is immobile in plants, which means that symptoms tend to show up in new growth first rather than in older leaves. Here are some ways that plants use sulfur:

- Sulfur is a major part of the flavor compounds in most plants, especially for things like onions, garlic, mustard greens, and cabbage.
- Sulfur helps with the creation of amino acids and proteins.
- Sulfur helps the enzymes used in photosynthesis and metabolism to function properly.
- Sulfur helps with the formation of chlorophyll.
- Sulfur helps plants tolerate stress.

If you suspect too little sulfur, look for uniform yellowing of the new leaves. The plants are usually stunted, as sulfur is needed for protein synthesis and for plant enzymes to function properly.

Symptoms of Sulfur Deficiency

- Weak stems that are thin and spindly

- Stunted growth with delayed maturity and poor fruit development.
- New leaves have uniform yellowing (chlorosis)

Symptoms of Sulfur Toxicity

- Plants are stunted with smaller leaves
- Leaf tips may be yellow or burnt
- Leaves are very dark green

SUMMARY OF SECONDARY MACRONUTRIENTS

NUTRIENT	MAIN FUNCTION	AFFECTED LEAVES FIRST	DEFICIENCY SYMPTOMS	COMMON DEFICIENCY CAUSES
Calcium (Ca)	Cell wall strength, tip, growth, enzyme signaling, root development, nutrient transport	New growth (top)	New leaves distorted, tip burn, blossom end rot, weak stems	Low Ca in mix, poor root uptake, low pH, high EC
Magnesium (Mg)	Central atom in chlorophyll, enzyme function	Older leaves	Interveinal yellowing or older leaves, curling edges, weak photosynthesis	Low Mg in mix, high K or Ca interfering, acidic pH
Sulfur (S)	Protein synthesis, enzyme function, flavor compounds (onions, garlic)	New growth	Uniform yellowing of new leaves, stunted growth, poor protein synthesis	Low S in mix, reverse osmosis water without supplementation

Micronutrients

In this section, when I refer to the term micronutrients, I mean the essential micronutrients. There are others, but we will just keep to the key ones. These represent the nutrients that plants need but in much smaller doses than the ones classified as macronutrients. We will look at seven key micronutrients and why they are important to the plants you are growing.

FE STANDS FOR IRON

Iron (Fe) is primarily used by plants for the production of chlorophyll. It will show up in your guaranteed analysis as Iron (Fe) and will almost always have a subnote related to how much is chelated iron. Chelation is a process that binds iron (and other nutrients) to an organic molecule, and this helps the nutrient stay soluble. It also helps in environments (like hydroponics) where the pH can fluctuate. Let's look at how plants use iron:

- Iron is essential in the production of chlorophyll (which gives plants their green color), which is crucial for photosynthesis.
- Iron helps with the transport of electrons during photosynthesis.
- Iron helps with activating the enzymes needed for nitrogen fixation and respiration.
- Iron helps with cellular respiration, which is vital for energy production in plant cells.

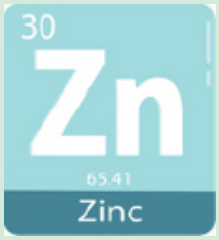
One of the most common symptoms of iron deficiency is interveinal chlorosis of the young leaves.

Symptoms of Iron Deficiency

- Leaves show signs of interveinal chlorosis, where the veins stay green and the space between them goes yellow
- Stunted growth and poor development
- Leaves may die and drop off

Symptoms of Iron Toxicity

- Leaves take on a bronze color, with dark spots on them



ZN STANDS FOR ZINC

Zinc (Zn) is partially mobile in plants, so issues related to imbalances can also show up in new or middle-aged leaves. You can find zinc in your guaranteed analysis as Zinc (Zn) often with a subnote related to the amount of chelated or water-soluble zinc the mix contains.

- Zinc helps activate enzymes necessary for the formation of chlorophyll.
- Zinc helps plants metabolize both starches and sugars for energy storage and seed development.
- Zinc helps in cell division and growth, synthesis of proteins, and gene expression.
- Zinc is a critical component in the plant’s ability to create auxins. These are the plant hormones that help cell walls become strong and rigid. Without them, plants can have stunted growth.

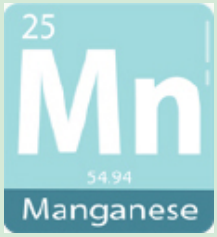
Too little zinc can cause new leaves to be small and curled or otherwise distorted. There can also be signs of interveinal chlorosis.

Symptoms of Zinc Deficiency

- Leaves show signs of interveinal chlorosis, where the veins stay green and the space between them goes yellow
- Shortened length between nodes (the part on the plant where branches originate)
- Small, weirdly shaped leaves, may be more narrow than normal

Symptoms of Zinc Toxicity

- Stunted plant growth
- Leaves may curl and new leaves may even roll up
- Tips of the leaves can turn brown or die



MN STANDS FOR MANGANESE

Manganese (Mn) plays crucial roles in photosynthesis, enzyme function, and plant defense. Symptoms most often show up in the plant leaves. In the guaranteed analysis, you will see it listed as manganese (Mn) with a subnote about the amount of chelated and/or water-soluble manganese.

- Manganese helps support photosynthesis; without manganese, plants can't effectively produce energy from light.
- Manganese helps with the production of chlorophyll.
- Manganese helps activate many of the enzymes that plants use for nitrogen metabolism and respiration.

Too much manganese also affects the leaves and can also cause brown spots (tiny ones).

Symptoms of Manganese Deficiency

- Leaves show signs of interveinal chlorosis, where the veins stay green and the space between them goes yellow

- Leaves can have a blotchy yellow appearance with necrotic spots and brown edges
- Leaf edges may curl upward
- Small, stunted plants

Symptoms of Manganese Toxicity

- Brown spots spreading across the surface of the leaves
- Chlorosis of the leaves, both interveinal and on the leaf edges

B STANDS FOR BORON

Boron (B) is immobile. It is once again the new growth that will show symptoms first. In the guaranteed analysis you will usually see it as boron (B).

- Boron helps with the formation and strength of cell walls.
- Boron plays a key role in the development of fast-growing parts of the plant (root and shoot tips).
- Boron helps with transportation of sugar and nutrients (especially calcium) around the plant.
- Boron is crucial for pollen germination, flower formation, and the development of fruits and seeds.
- Boron helps with the development of the healthy root caps necessary for proper nutrient uptake.

If you don't have enough boron in your nutrient solution, you may notice that your leaves are deformed and brittle. Symptoms also show in the roots, which tend to be discolored and shorter than normal, and in the fruits, which can be deformed or have cracked skins.

Symptoms of Boron Deficiency

- Hollow or cracked stems, fruits, or roots
- Reduced flowering and few fruits
- Terminal bud death, where the growing tips turn black
- Leaves that are small, deformed, thickened, brittle with dark spots

Symptoms of Boron Toxicity

- Space between nodes shortened and growth is stunted
- Leaves show signs of interveinal chlorosis, where the veins stay green and the space between them goes yellow
- Root tips may become dark, roots may thicken and get brittle

CU STANDS FOR COPPER

Copper (Cu) is immobile in plants, so you will notice symptoms first in young leaves and growing tips. In your guaranteed analysis, it will usually show up as copper (Cu) with a subnote for the amount of chelated copper that is included. Below are some of the ways that copper helps plants grow strong:

- Copper helps plants with photosynthesis, as it plays a key role in chloroplast function.
- Copper helps plants build structural strength by promoting the creation of lignin, which reinforces cell walls and helps plants stand upright.
- Copper helps plants form pollen and promotes fertility.
- Copper helps plants fight both bacterial and fungal infections.

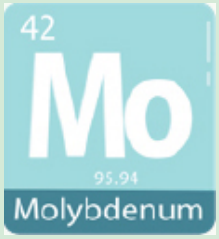
A key indicator of copper deficiency is very dark green leaves.

Symptoms of Copper Deficiency

- New leaves are dark green with twisted and curled edges
- Plant can start to wilt even though it has full access to water
- Leaf tips are dark green and may die back
- Plants don’t produce many flowers and pollen may be sterile
- Plants have stunted growth and weak stems, as they do not have enough lignin

Symptoms of Copper Toxicity

- Not many branches are growing
- Leaves show signs of interveinal chlorosis, where the veins stay green and the space between them goes yellow
- Slow plant growth



MO STANDS FOR MOLYBDENUM

Molybdenum (Mo) helps plants to grow and develop. Deficiency or toxicity symptoms tend to show up in older leaves first. In your guaranteed analysis, you will see it show up as molybdenum (Mo), but a lot of mixes don't include it. Out of all the nutrient solutions I own, the only one I have with molybdenum is Advanced Nutrients Micro. Let's look at how it helps your plants:

- Molybdenum helps plants metabolize nitrogen and produce enzymes that convert nitrate to ammonium. Plants then use ammonium to synthesize amino acids and proteins.
- In legumes, molybdenum helps with nitrogen fixation in root nodules, by helping plants convert atmospheric nitrogen to ammonia.

Some premade micronutrient mixes (including Advanced Nutrients Micro, shown here) include molybdenum.

- Molybdenum helps support the plant's metabolism of sulfur and helps with your plant's ability to access and use phosphorus.
- Molybdenum helps plants produce chlorophyll and develop flowers and seeds.

Symptoms of Molybdenum Deficiency

- Older leaves start to turn yellow (chlorosis)
- New leaves can be twisted or cupped
- Plants have less flower and fruit development

Symptoms of Molybdenum Toxicity

- Rare, as plants can usually tolerate excess molybdenum
- Leaves are discolored, can take on an orange, yellow, or brown color

SUMMARY OF MICRONUTRIENTS

NUTRIENT	MAIN FUNCTION	AFFECTED LEAVES FIRST	DEFICIENCY SYMPTOMS	COMMON DEFICIENCY CAUSES	TOXICITY SYMPTOMS	COMMON TOXICITY CAUSES
Iron (Fe)	Chlorophyll synthesis, respiration	Young leaves	Interveinal chlorosis on young leaves, pale new growth	High pH (>5.5), competition with P, poor Fe type plant absorption	Bronze spots, leaf necrosis, inhibited root growth	Overuse of Fe chelates
Manganese (Mn)	Photosynthesis, enzyme systems	Young/mid leaves	Interveinal chlorosis on young leaves, pale new growth	High pH, low Mn in solution, excess Fe or Zn	Brown spotting, chlorosis, Fe lockout	Excess (Mn) in mix or water
Zinc (Zn)	Growth hormone (auxin) production, enzyme activation	Young/mid leaves	Shortened internodes, small twisted leaves, interveinal chlorosis	High pH, low Zn in mix, cold temps	Fe and Mn lockout, darkened roots, leaf burn	Overuse of Zn in micro mix
Boron (B)	Cell wall formation, new pollen tube growth	New growth	Deformed new growth, brittle leaves, poor	Low B in solution, pH imbalance, excess Ca	Leaf margin necrosis, thick or	Narrow safety margin;

			fruit set, hollow stems		leathery leaves	excess dosing
Copper (Cu)	Reproductive growth, photosynthesis	Young leaves	Pale young leaves, dieback of growing tips, weak stems	Low Cu in mix, high pH, reverse osmosis water, lacking Cu	Root stunting, chlorosis, Fe lockout, leaf darkening	Overuse of Cu fungicides or nutrients
Molybdenum (Mo)	Nitrogen metabolism (nitrate reduction)	Older leaves	Yellowing like N deficiency, twisted leaves, poor flowering	Very low Mo in mix, very low pH	Rare - may cause leaf discoloration or interfere with Cu	Extremely rare in hydroponics

ABOUT THE AUTHOR

Kiri Martin lives in Ontario, Canada and has a passion for growing both indoors hydroponically and outdoors in just about any space she can find. She has been growing food hydroponically for more than 10 years using her growing collection of AeroGardens, Click & Grow gardens, and Rise Gardens. Never one to just follow the crowd, she loves to conduct experiments to test out different methods and techniques and challenge the gardening status quo in an effort to find the “best” way to grow food indoors. She is a self-proclaimed plant nerd and has a passion for encouraging, inspiring, and empowering others to grow food. She does this through her two YouTube channels and social media.
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